

## **Tri-Agency Forecast Discussion for September 18, 2010**

Created 1600 UTC September 18, 2010

GRIP Forecast Team: Jon Zawislak, Cerese English, Dan Harnos, Dave Zelinsky, Kim Wood, Richard Maliawco, Diana Stovern, Joshua Cossuth, and Ryan Truchelut

**Summary:** Today is a no fly day for all three agencies. After a very successful set of missions to study Karl from the time it was an incipient disturbance through its landfall as a major hurricane, the three agencies are now turning their sights on the central Atlantic to look for other possible genesis cases. PREDICT will likely fly PGI-46L tomorrow, but GRIP and IFEX do not currently have any flights scheduled. As Igor and Julia move further north and toward extratropical transition, PGI-45L looks a little more promising today in the East Atlantic. Remnant Low Karl is decaying over the mountains of central Mexico, and PGI-46L is difficult to find, let alone track, however a few models persist the vorticity associated with the system into the Caribbean in a few days.

### **Forecast for 1600 UTC 9/18/2010:**

#### **Synoptic Overview:**

The tropical Atlantic basin is temporarily quieting down overall today, and so are tri-agency operations for the time being. At the surface across the basin (**S1**), Karl has become a remnant low over the mountains of central Mexico, Igor is finally moving north and weakening slightly as it heads toward Bermuda, Julia has been downgraded to a Tropical Storm and is rapidly decaying, PGI-46L looks poorly organized today (**46A**), and PGI-45L may finally be organizing, but has some limiting factors that will determine if it will undergo genesis and what its track will be.

In the western portion of the basin, the western Gulf of Mexico is dominated by convection associated with a trough near the coast of Texas (**S2, S3**). This trough moved west over the last few days coincident with the propagation of Karl to the west (**S1**). This portion of the wave Karl was embedded in continued to produce showers and thunderstorms to the north of Karl, and was responsible for a great deal of the convection in the northwestern Gulf yesterday during Karl's landfall. The vorticity signature at low levels associated with this system can be seen over southern portions of Texas this morning (**C4**). At upper levels, a weak anticyclone sits over this region (**C1, C3**). There is an upper level trough over the western Caribbean (**C3**), and very quiet conditions prevail in the central and east Caribbean and the Bahamas (**S2**). TPW imagery (**S4**) shows that max dry air at low levels is over FL, the Bahamas, and the eastern Caribbean, whereas Water Vapor imagery (**S6**) shows the max dry air aloft is over Igor and extends diagonally south to the western Caribbean. Wind shear is generally low to moderate across the whole Gulf and Caribbean (**C2**), but to the East of the Windward Islands there is a shear maxima, as well as to the W and NW of Igor.

The steering pattern in the central-east Atlantic is dominated by ridging around 34N/40W (**S1**). Both Igor and Julia are being advected clockwise around the periphery of this high. To the south, the ITCZ axis contains both PGI-46L and PGI-45L. Between the

ITCZ and the mid-Atlantic high, a large area of SAL (**S4**) extends from the eastern edge of Julia, southeast to the outside of PGI-45L, and east-northeast to the African coast. Dry air associated with this layer is inhibiting convection in PGI-46L (**S6**). A powerful upper tropospheric Equatorward outflow channel (**C1**) associated with the very large Hurricane Igor is located between 10N and 30N along 55W and is inducing strong northerly shear (**C2**) over a weakening Tropical Storm Julia and inducing weak upper-level convergence over PGI-46L.

Further eastward, PGI-45L (now Invest 94) remains shielded from dry air (**S4**) to the north and stronger wind shear to the south (**C8**). This feature has become better defined in the past 24 hours, showing some low-level cyclonic circulation and more persistent convection generally co-located with the 850hPa vorticity maximum (**C6**). PGI-45L is moving slowly northwest due to generally weak steering currents (**C9**) between the central Atlantic ridging and an upper-level trough along 20W north of 25N. Over Africa, PGI-47L tracks closer to the Atlantic as the ITCZ is overall characterized by diurnally varying scattered showers and thunderstorms (**S7**).

### **Features of Interest:**

#### **Ex-Karl/Eastern Pacific system:**

Hurricane Karl made landfall late yesterday morning about 15-km north of Veracruz Mexico. Today, the remnant midlevel circulation appears to be dissipating over southern Mexico. At 1200 UTC on September 18, the remnant circulation of Karl was positioned at approximately 20.6° N and 97.6° W. As the system continues to move west or west-southwestward over the next couple of days, the remnant circulation could emerge into the eastern Pacific. Current 700-hPa vorticity analysis shows the circulation currently over Mexico. There is another vorticity maximum located off the coast of Mexico over the eastern Pacific (**K1**). Forecasts show the possibility exists for the remnant mid-level circulation to combine with a developing tropical system in the eastern Pacific (**K2**).

The system currently over the eastern Pacific and remnants of Karl are both visible on IR satellite imagery (**K3**). Conditions appear favorable for development of the system with warm SSTs off the coast of Mexico (**K4**). Very high easterly 200-900-hPa wind shear currently exists (**K5**) but is forecast to decrease somewhat for a short window over the next couple of days (**K6**). Also, wind shear decreases further north, and so as the system tracks further northwest this will become less of an inhibiting factor for development. Water vapor imagery also shows the abundance of moisture across the eastern Pacific (**K7**). Further evidence exists in the MIMIC TPW analysis (**K8**). Most of the models develop eventually develop a system off of the eastern Pacific and track it northwestward over the next several days. The ECMWF, GFS, NOGAPS, and CMC models are in fairly good agreement on this. Some models do show that the mid-level vorticity associated with ex-Karl combines with this system off of the coast as it develops and tracks northwestward (**K9**).

### **Hurricane Igor:**

Hurricane Igor has weakened somewhat in the last 24 hours. Though the maximum sustained winds are 95 kt, the minimum central pressure has dropped from 940 hPa at 1200 UTC yesterday to 939 hPa at 1200 UTC today. Again, this low central pressure is likely a reflection of the large size of Igor (**I1**). Shear is increasing to the north of the storm, with the outer bands encountering shear of 40-50 kt (**C2**). Igor is moving approximately northwest at about 11 kt. The storm is still positioned south of the ridge that has been steering it for the last few days, but this ridge should weaken as a trough approaches from the west and turns Igor northward to impact Bermuda. 0600 UTC model guidance for Igor's track is in fairly good agreement through 96 hours with a slow northwest to northeast recurvature as the eastward-moving trough encounters the storm, and the NHC official track forecast reflects the guidance fairly closely (**I2**). 1200 UTC intensity guidance is also in good agreement as all show either slight intensification or a constant intensity through 24 hours followed by gradual weakening, and most are no longer calling for re-intensification after extratropical transition occurs, a process which should be completed by 96 hours.

### **Tropical Storm Julia:**

Julia was downgraded to a tropical storm overnight. An area of circulation is still visible in the satellite, however active convection remains only in the southeast quadrant of the storm (**J1**). As of 0900 UTC, Julia had an estimated central pressure of 995 hPa and maximum sustained winds of 50 knots (NHC). It remains on a northwest track moving at 16 knots and will continue to move into an area of increasing wind shear (**C2**). Julia is expected to further weaken as it gets swept into the flow of the subtropical high and will move into a region of cooler SSTs which will accelerate its deterioration. It is expected to be downgraded to a tropical depression within 48 hours (**J2**). Both the GFS and ECMWF models agree that within 78 hours Julia will merge with hurricane Igor as a remnant low (**J3**).

### **PGI-45L/ AL94:**

AL94 is located at 13.1N/27.3W. The convective structure appears better organized today (**45A**), and the NHC has increased the probability of development to 30%. Low level vorticity has increased slightly near the pouch center, although it is somewhat displaced from the convection. The environment around AL94 is somewhat favorable with low shear, and moderate, but increasing, SSTs (**45B**). However, there is substantial dry air to the north and TPW is low to the north and west of the pouch (**S4 and S6**).

There is very high degree of uncertainty for the future of this system. Several global models indicate that its development will hinge somewhat on a potential vortex interaction with vorticity that is loosely related to PGI-46L, as well as future interaction with PGI-47L. The GFS and ECMWF both indicate the vorticity of PGI-46L being stretched out, with some becoming wrapped into the circulation of AL94 (**45C**). Later on, the ECMWF also indicates an interaction and potential merger with PGI-47L. Such interactions should act to enhance the vortex of AL94, however development remains a possibility even if the interactions are minimal.

The operational 0000 UTC ECMWF forecast develops the system into a tropical cyclone within the next 72-96 hours, however its track is highly uncertain. While the pouch tracking indicates a slow gradual northwest track, this is very simplified. As the ridge weakens, the system will indeed move gradually northwestward. However, the BAM shallow, mid, and deep models exhibit the degree of uncertainty beyond the next 48 hours (**45E**). If AL94 develops and deepens, the deep layer steering currents could bring it straight north, with recurvature possible unusually far east. However, if it remains relatively weak and shallow, the return of the subtropical ridge will turn the system westward, crossing 50W in roughly 7-10 days. The ECMWF ensembles exhibit this uncertainty, as several members strengthen the system enough to bring it northeastward, while several others turn a presumably weaker system to the west (**45E**).

#### **PGI-46L:**

PGI-46L this morning as of 1200 UTC is fixed by consensus at 12.1°N, 43.8°W in a region of low wind shear (**46A**). Convective activity this morning is widely scattered throughout the pouch and has declined significantly in the past 24 hours with only a few overshooting tops (**46B**). A partial ASCAT pass this morning revealed little in the way of an earth-relative circulation, with winds near zero across the entire pouch region (**46C**). The pouch itself remains only partially embedded in the ITCZ with dry air at low levels across its northwestern portion in the TPW fields with a large area of dry air associated with the current SAL outbreak (**46D**), as noted in the GEOS-5 initialization (**D2**).

The GFS has some trouble tracking the pouch through 24 hours before picking it up and brings the system on a nearly due west track (**46E**). The ECMWF picks up the pouch at 24 hours and brings the system on a more west-northwesterly track (**46F**). Both models vary significantly in the initial position of the pouch, with the GFS picking it up near 35°W and the ECMWF at 47°W due to the initial poor definition of the pouch, with the GFS pouch reaching the Leeward Islands at 1200 UTC Wednesday and the ECMWF at 0000 UTC Tuesday. The initialization of the ECMWF (**46G**) does show the vorticity the GFS is tracking however the pouch fix has been selected with the western lobe initially. The Both models keep vorticity and OW values small through 5 days with sufficient moisture throughout and low wind shear (**46E**, **46F**). Both the GFS and ECMWF depict most if not all of the vorticity associated from PGI-46L being absorbed into PGI-45L, as noted in that portion of the discussion.

#### **SAL/Dust:**

Yesterday's CIMSS analysis which showed a large mass of dry air off the coast of Africa moving westward towards Julia has since reached the storm and is starting to impinge upon the flow. Large quantities of particulates and aerosols reside in this layer will likely affect Julia's rate of deterioration (**S5**). Current TPW imagery shows dry air across the same region (**S4**). GEOS-5 model analysis suggests much of the dry air across the eastern Atlantic is associated with activity in the SAL. The current 850-hPa analysis shows large quantities of dust over Africa extending westward and wrapping around Julia (**D1**) with the heaviest dust layer at the 700-hpa level (**D2**). The 24-hour forecast shows the dust continuing to propagate eastward, which may possibly the affect the circulation

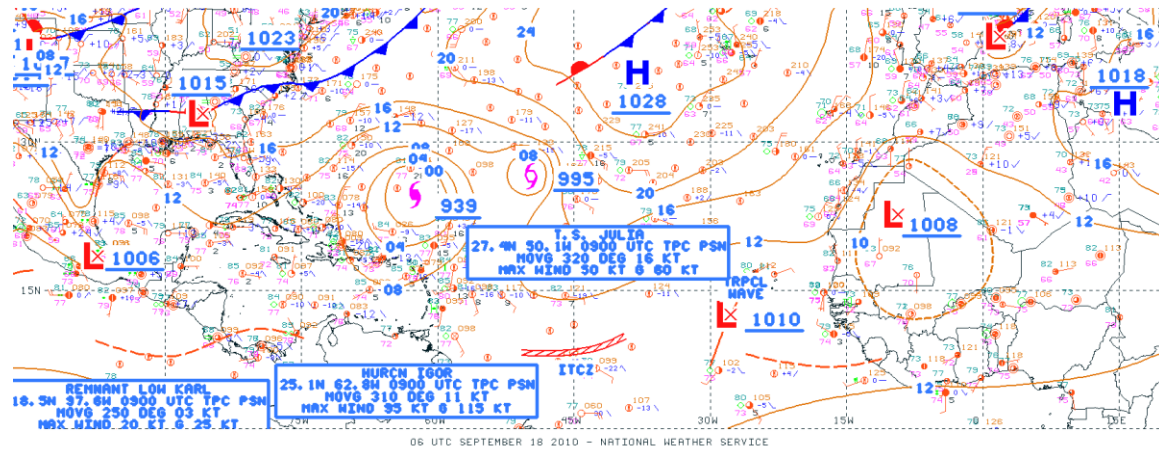
of Igor (**D3**). PGI-45L remains to the south of the large swath of dust, but small quantities of dust creeping into the area may impact this system in the future.

*Forecasters: Zawislak, Inglish, Harnos, Maliawco, Zelinsky, Wood, Stovern, Cossuth, Truchelut*

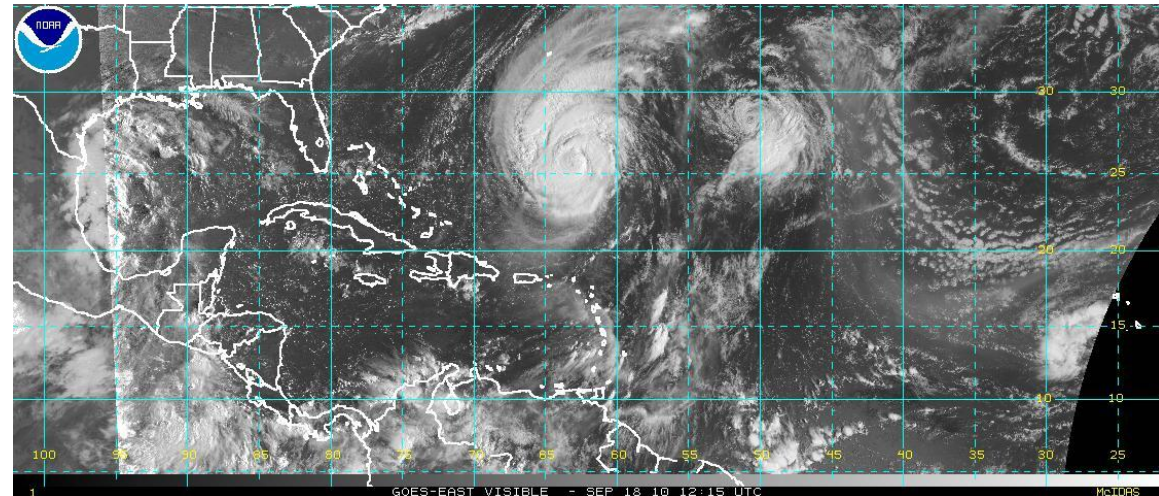
## Images used in discussion:

### Synoptic Overview Images

S1

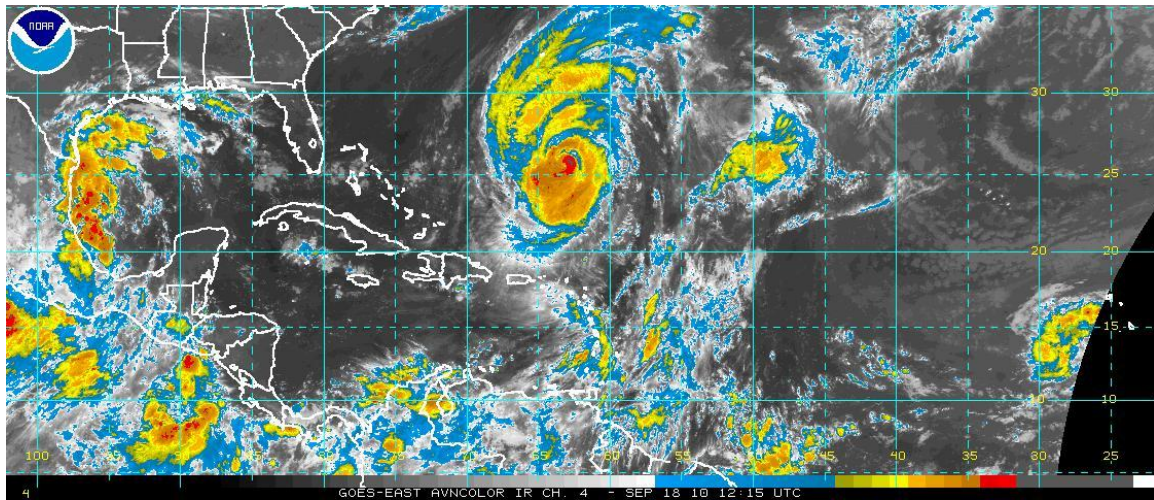


S2- GOES VIS

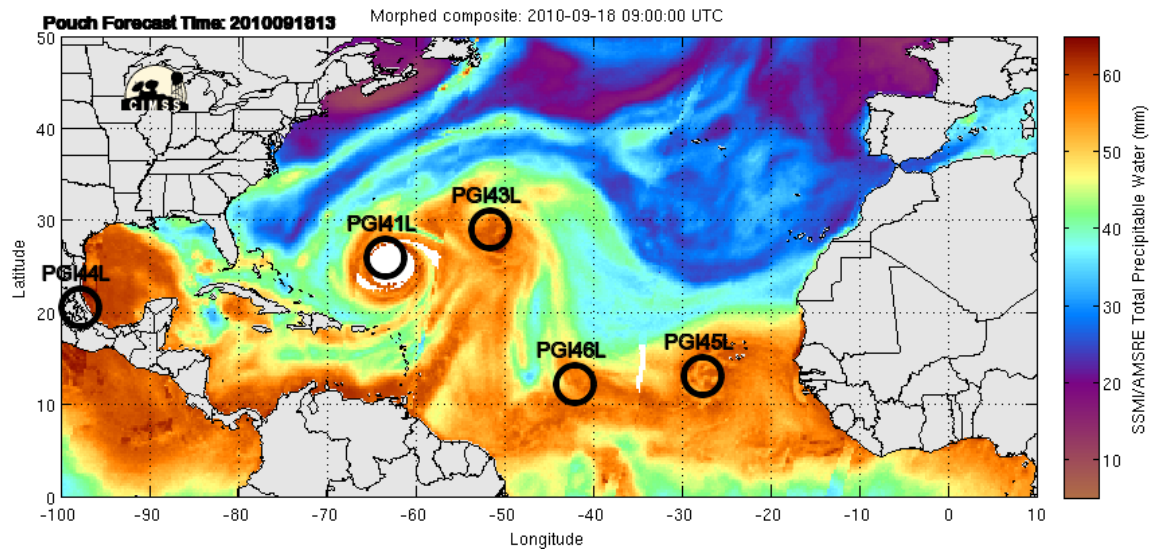




### S3- GOES IR

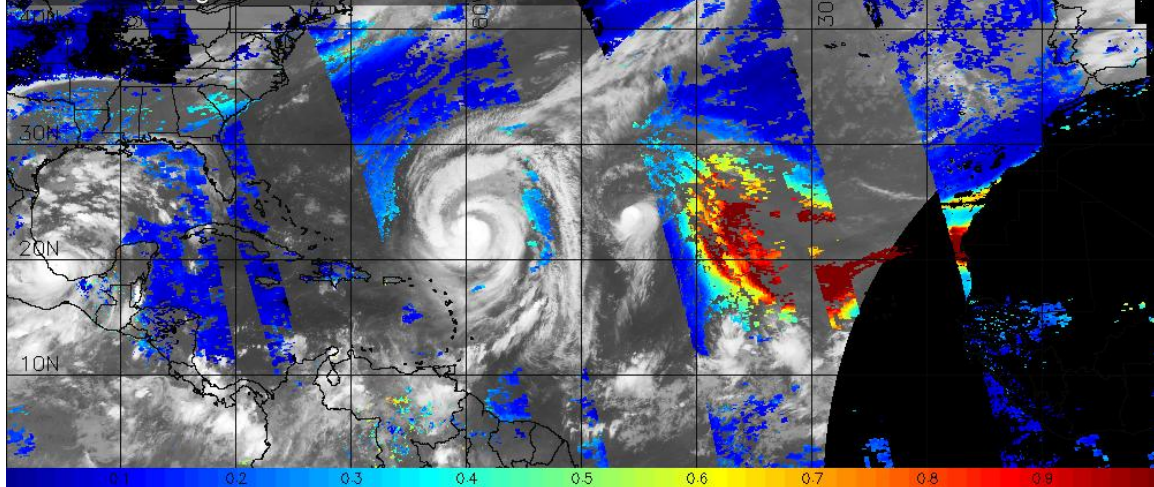


### S4- CIMSS TPW with Pouch Positions



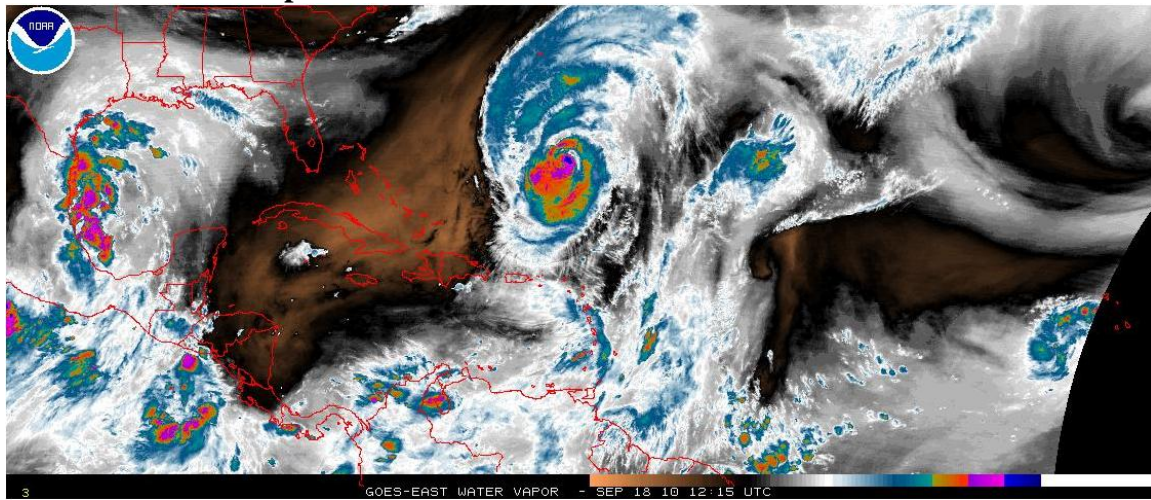
### S5- AOT from AQUA via the JPL GRIP support site:

24 hours ending 2010/09/18 0000Z AQUA AOT

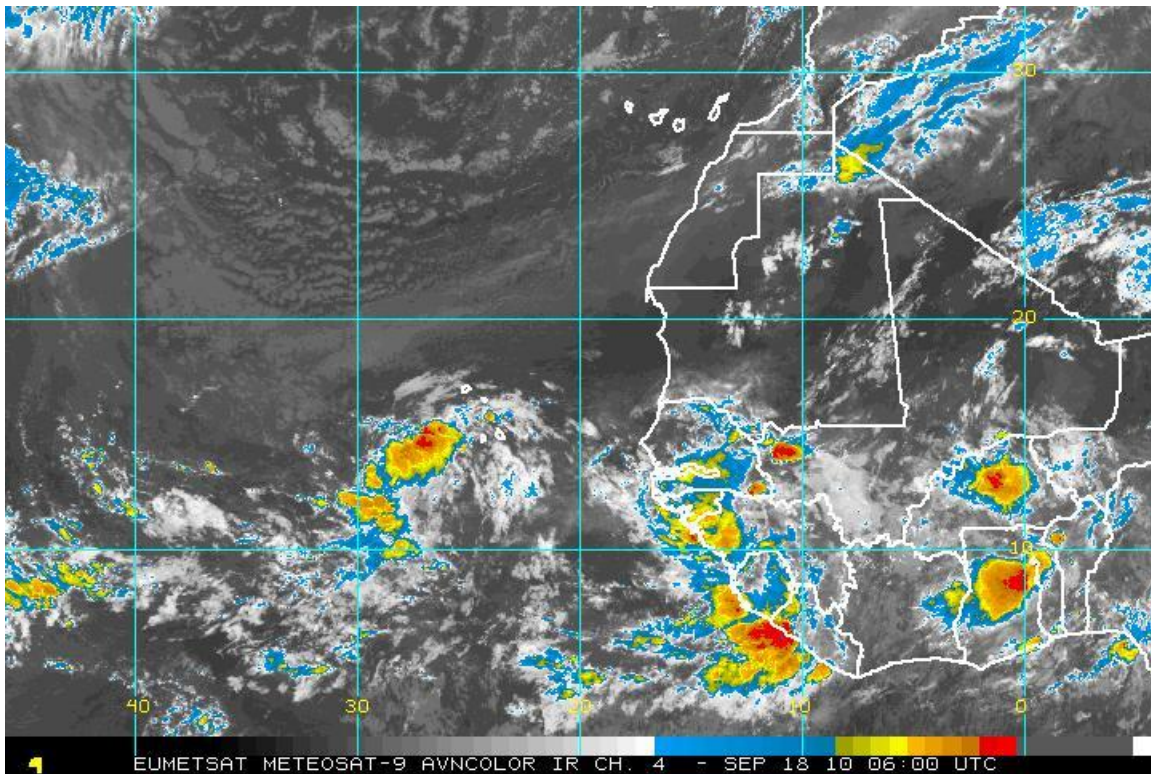




### S6- GOES Water Vapor:



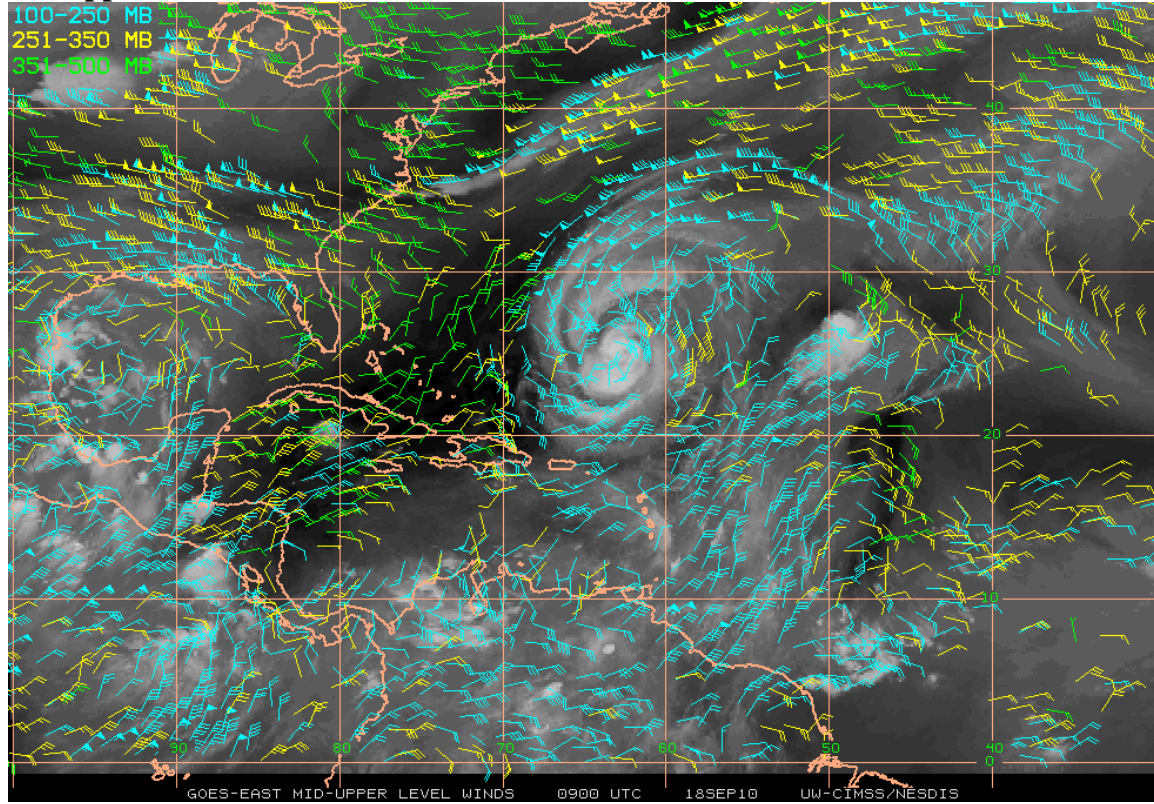
### S7- METEOSAT IR



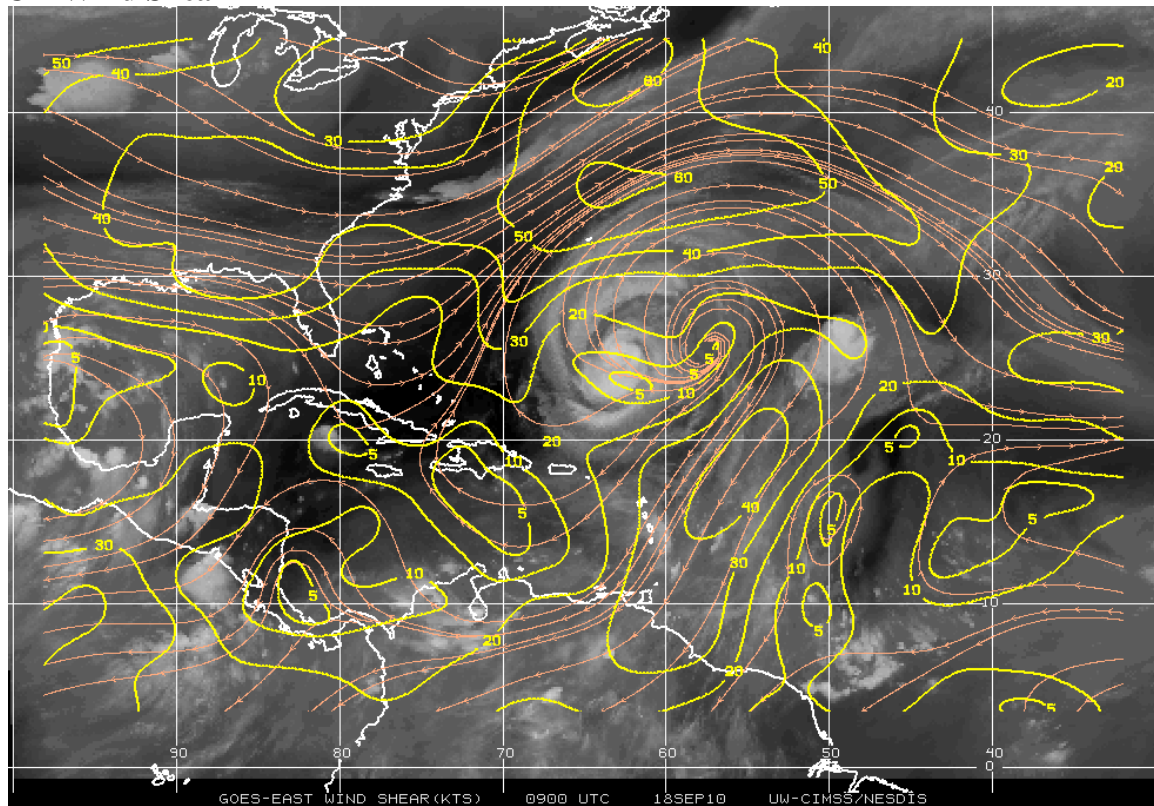


## **CIMSS Analyses:**

### **C1- Upper Level Winds**

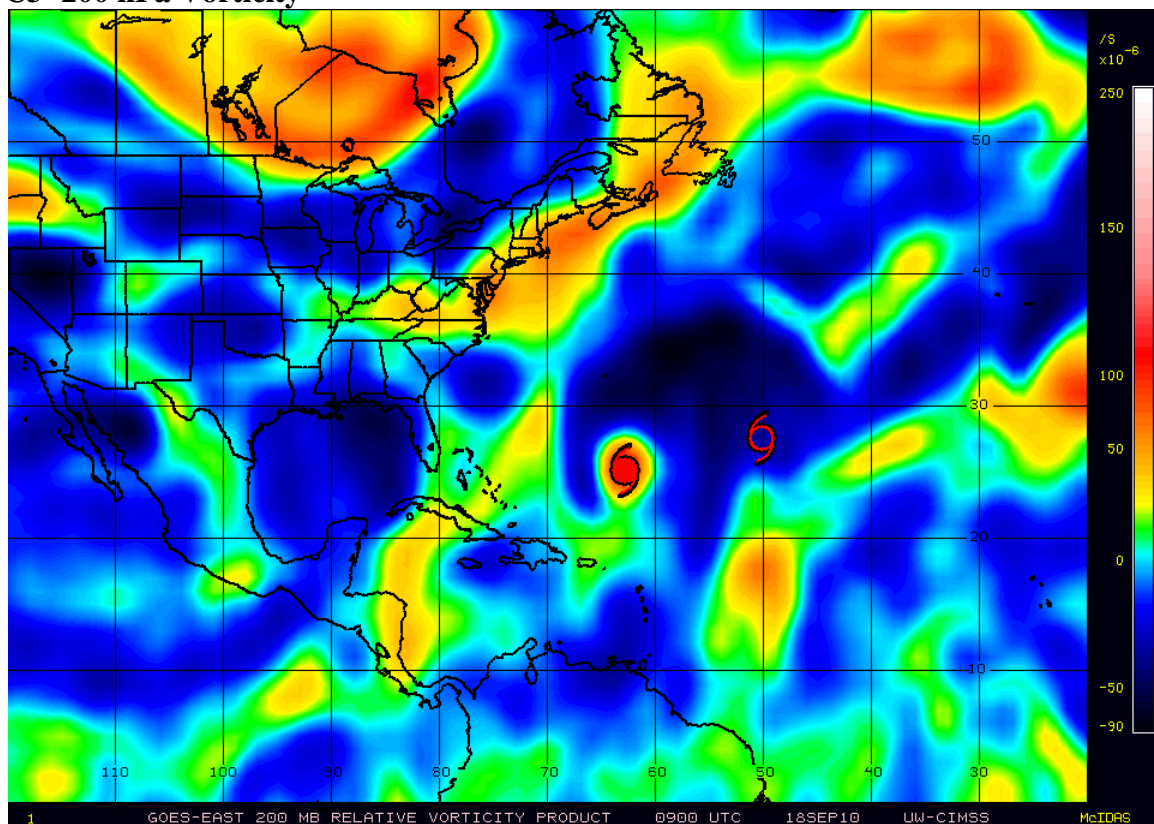


### **C2- Wind Shear**

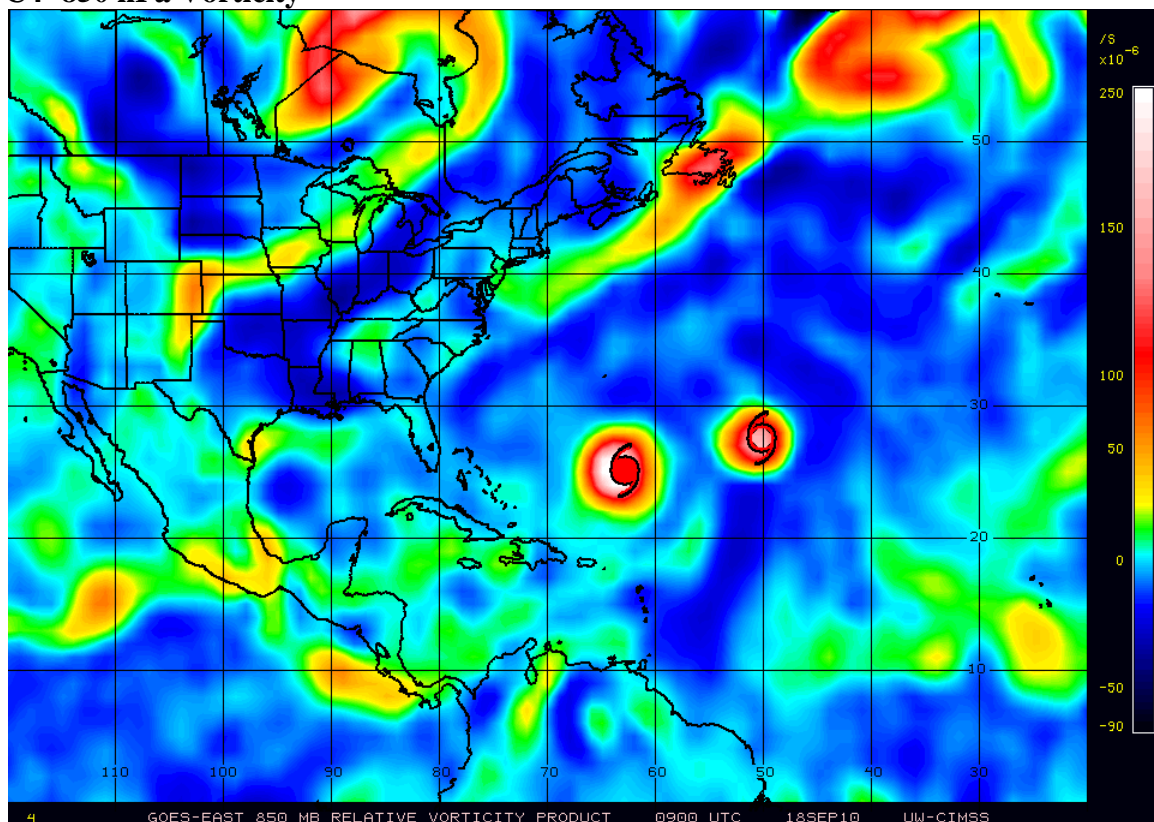




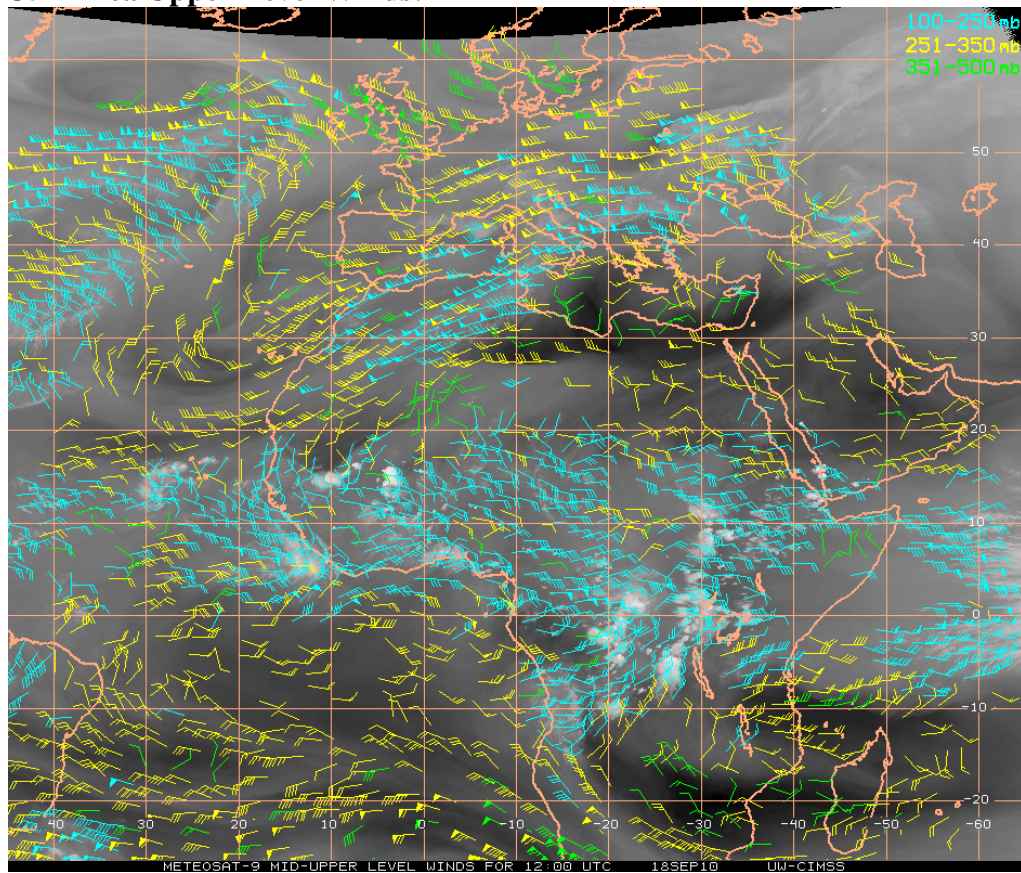
**C3- 200 hPa Vorticity**



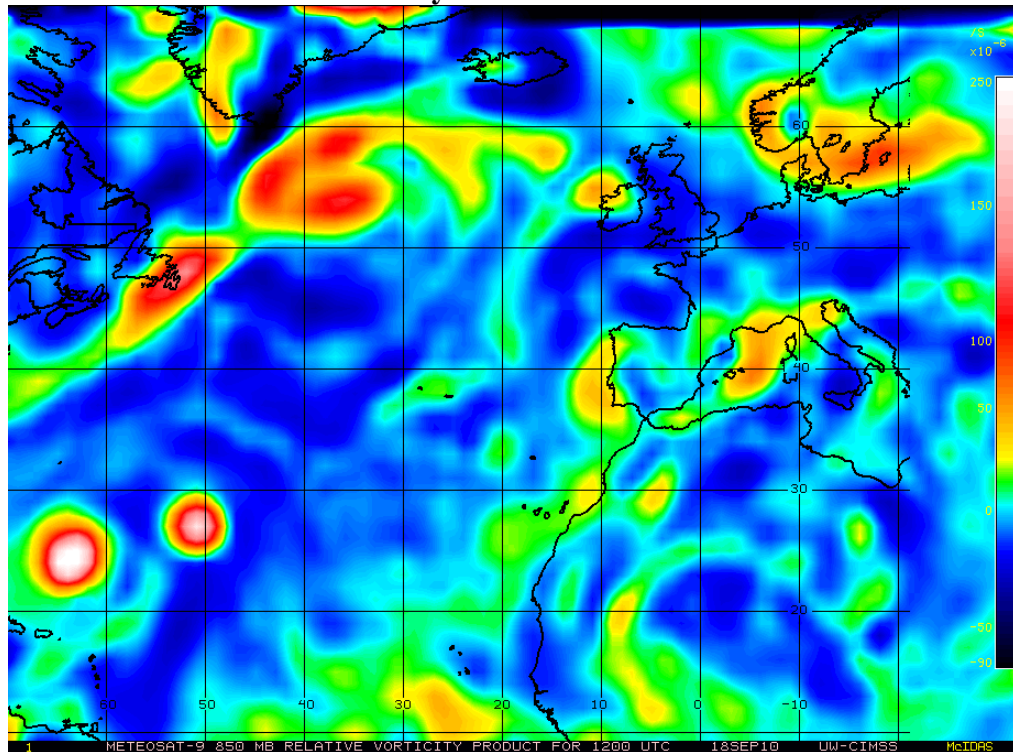
**C4- 850 hPa Vorticity**



### C5 Africa Upper Level Winds:

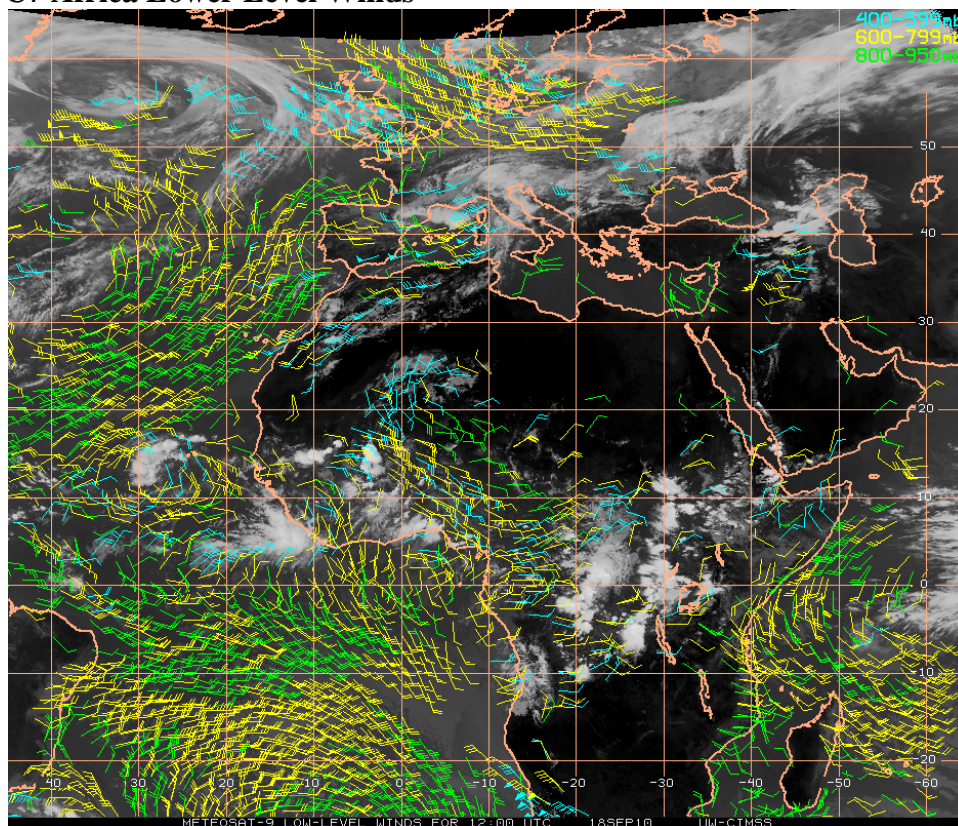


### C6 Africa Lower Level Vorticity

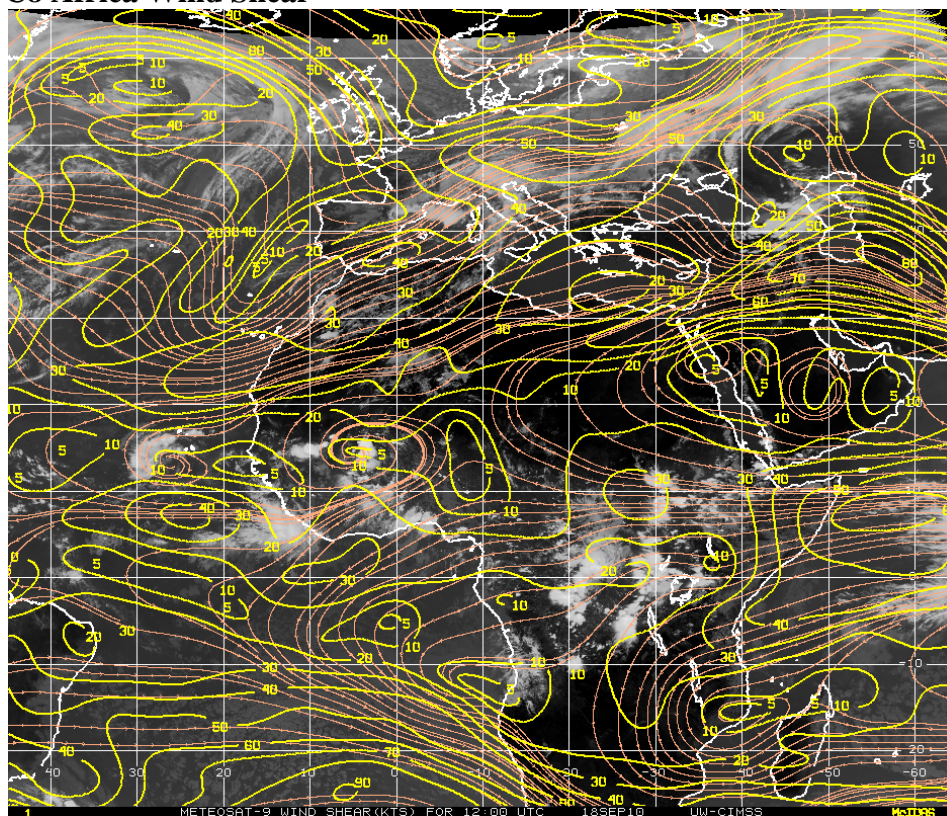




## C7 Africa Lower Level Winds

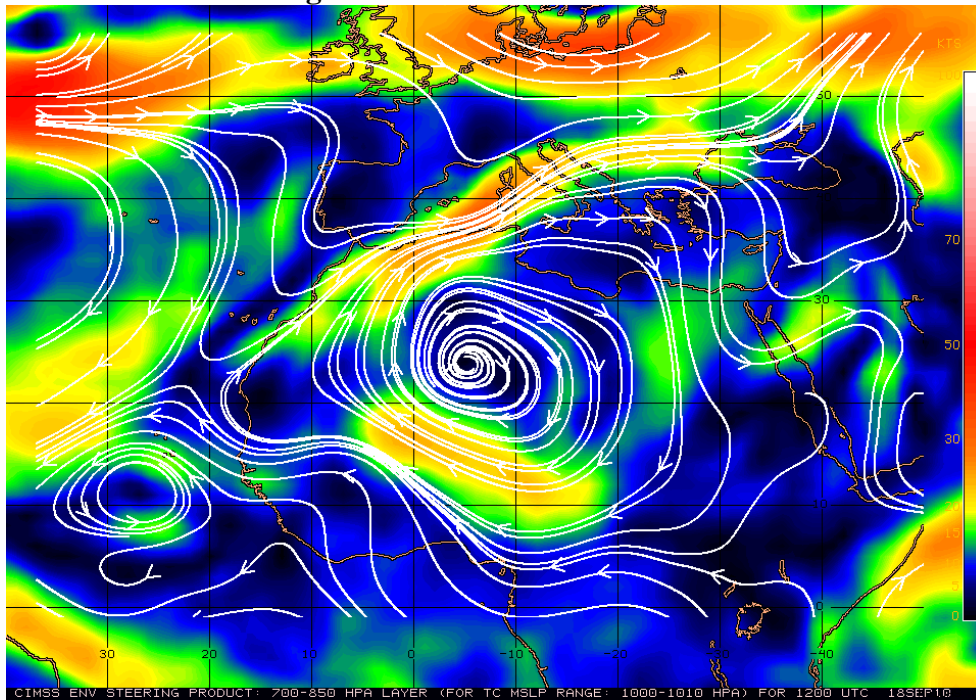


## C8 Africa Wind Shear





## C9 700-850mb Steering Flow over Africa

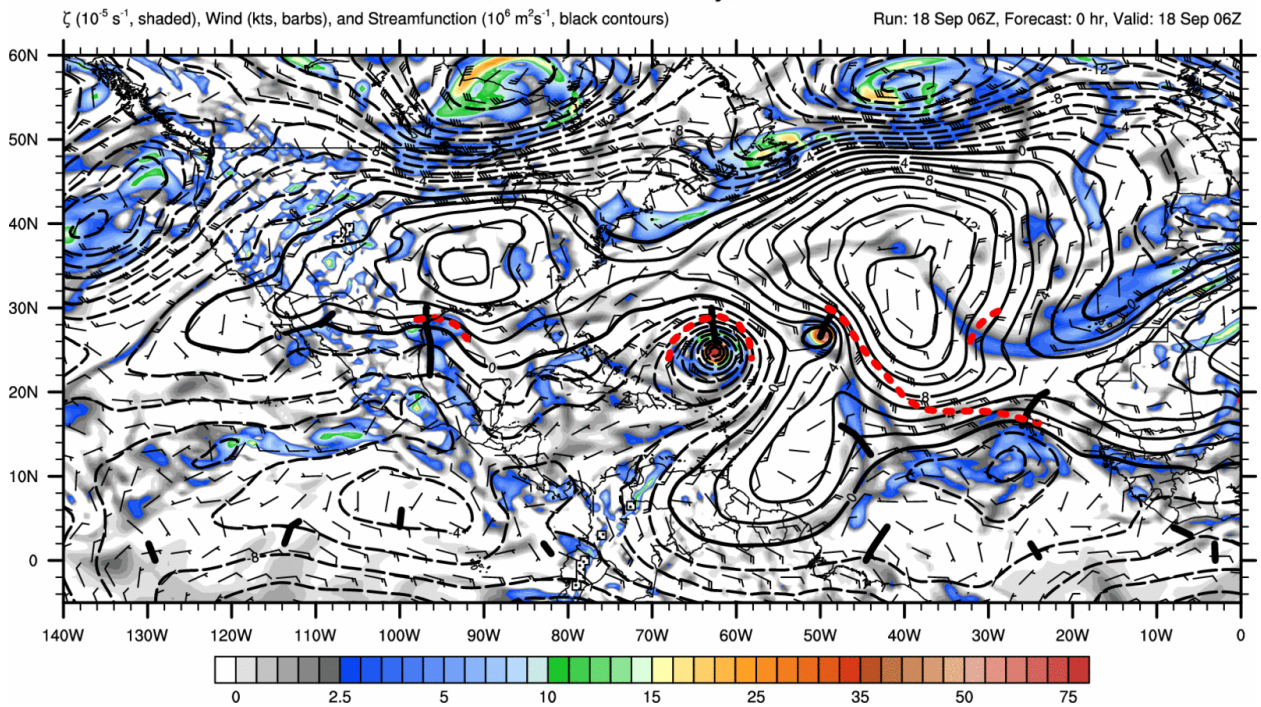


## Features of Interest Images

### Remnant Low Karl

K1

## 700 hPa Wind, Relative Vorticity, and Streamfunction



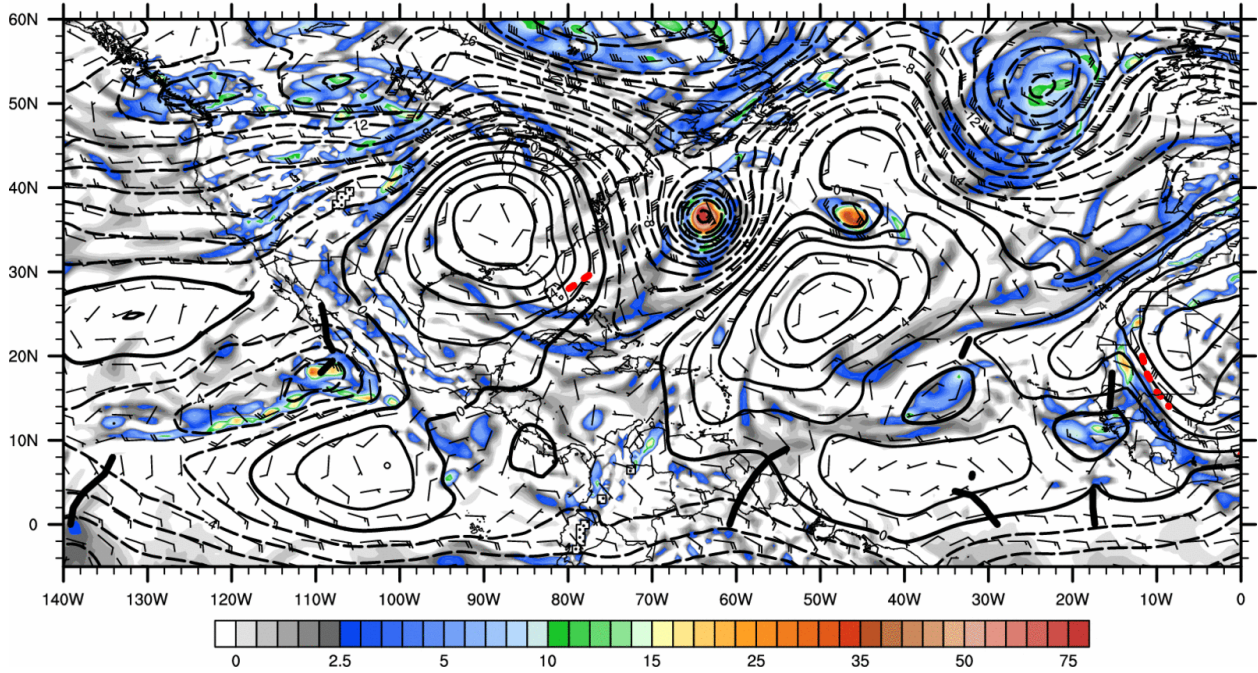


K2

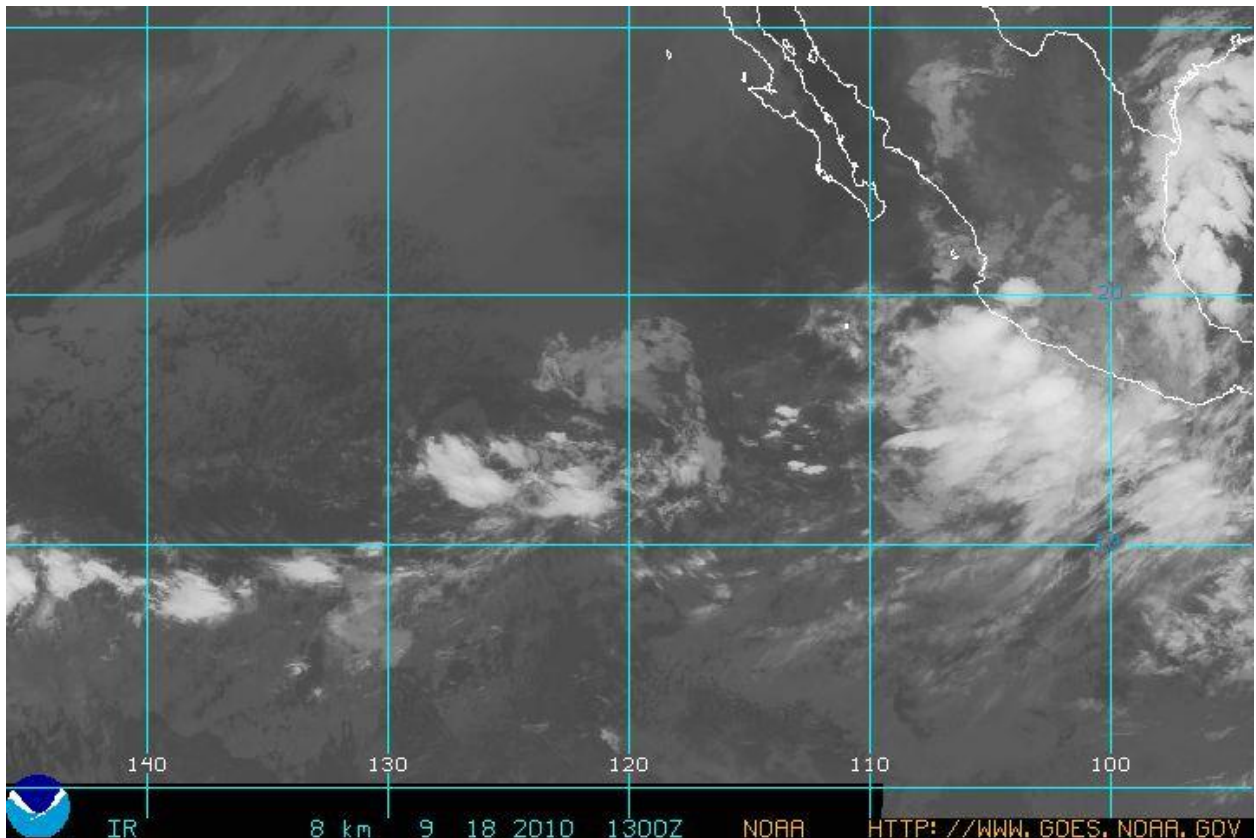
### 700 hPa Wind, Relative Vorticity, and Streamfunction

$\zeta$  ( $10^{-6} \text{ s}^{-1}$ , shaded), Wind (kts, barbs), and Streamfunction ( $10^6 \text{ m}^2 \text{ s}^{-1}$ , black contours)

Run: 18 Sep 06Z, Forecast: 60 hr, Valid: 20 Sep 18Z

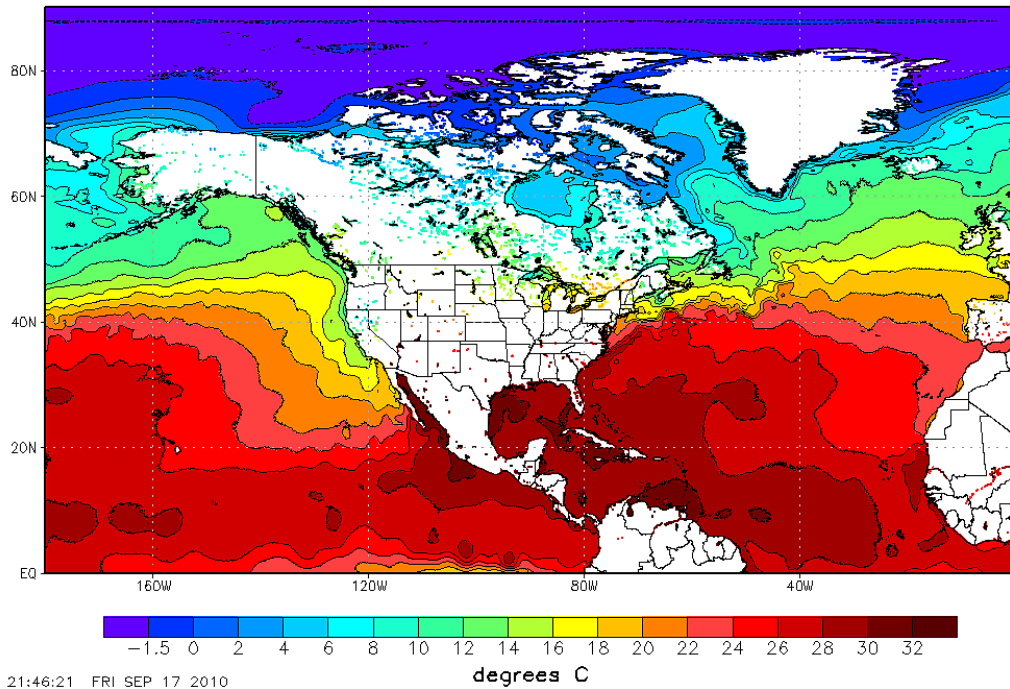


K3



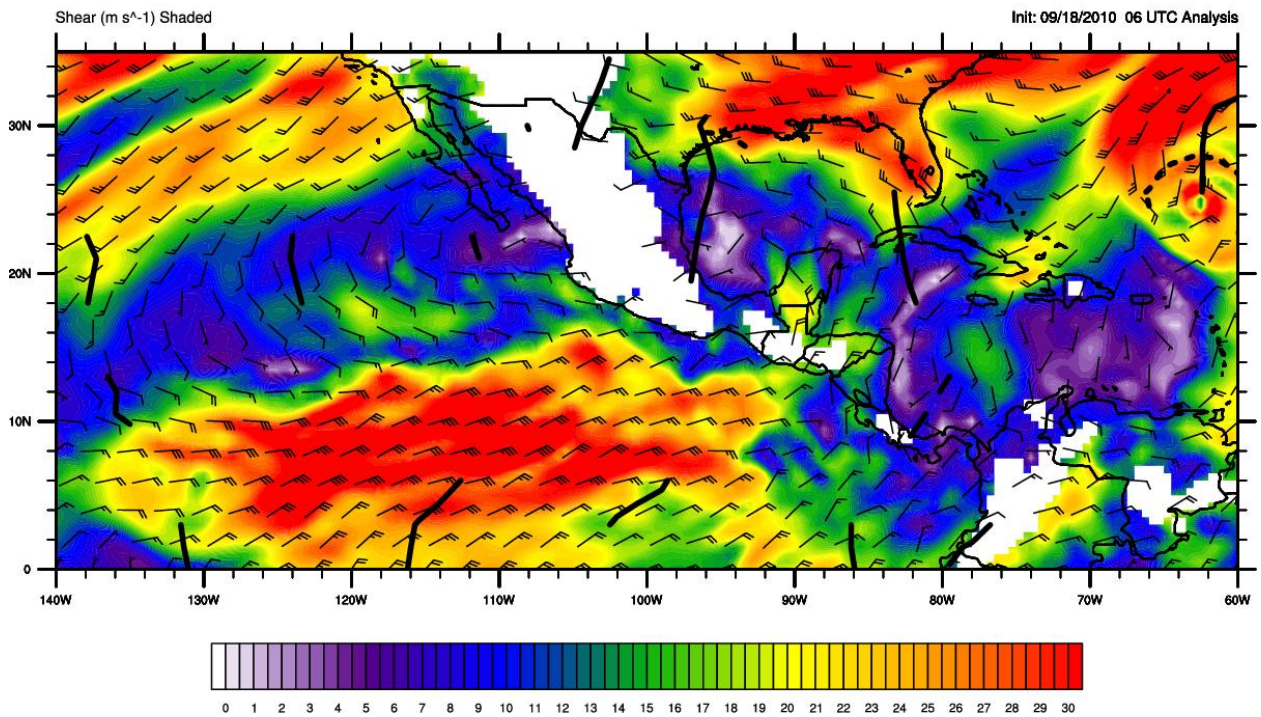
K4

NOAA/NWS/NCEP/EMC Marine Modeling and Analysis Branch Oper H.R.  
RTG\_SST Analysis (0.083 deg X 0.083 deg) for 17 Sep 2010



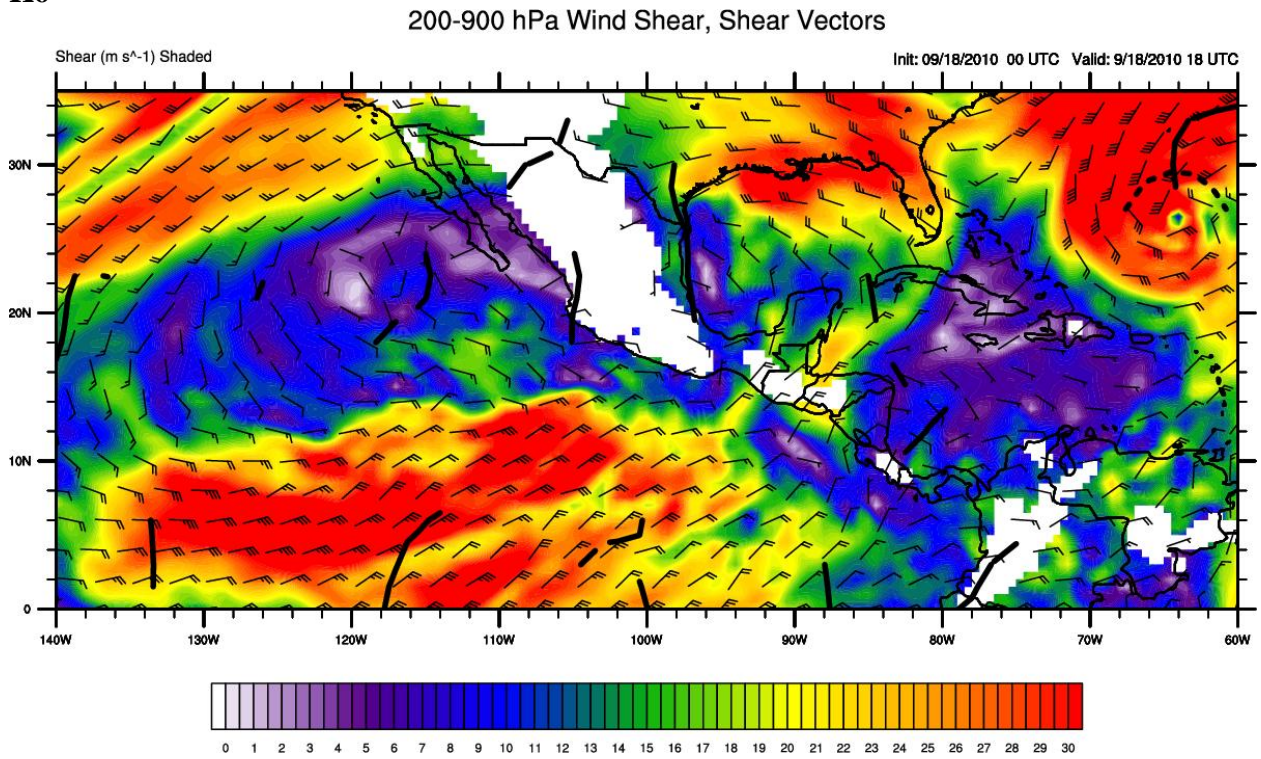
K5

200-900 hPa Wind Shear, Shear Vectors

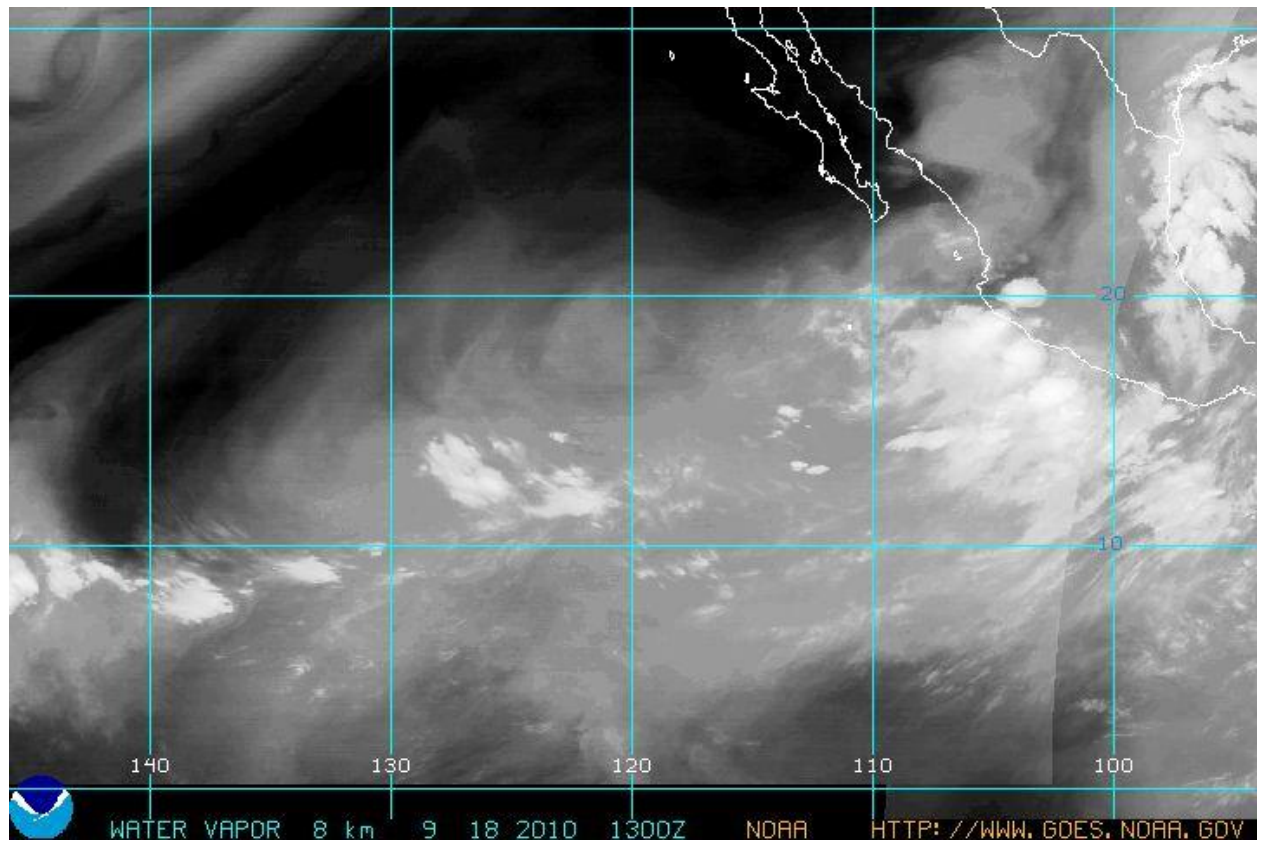




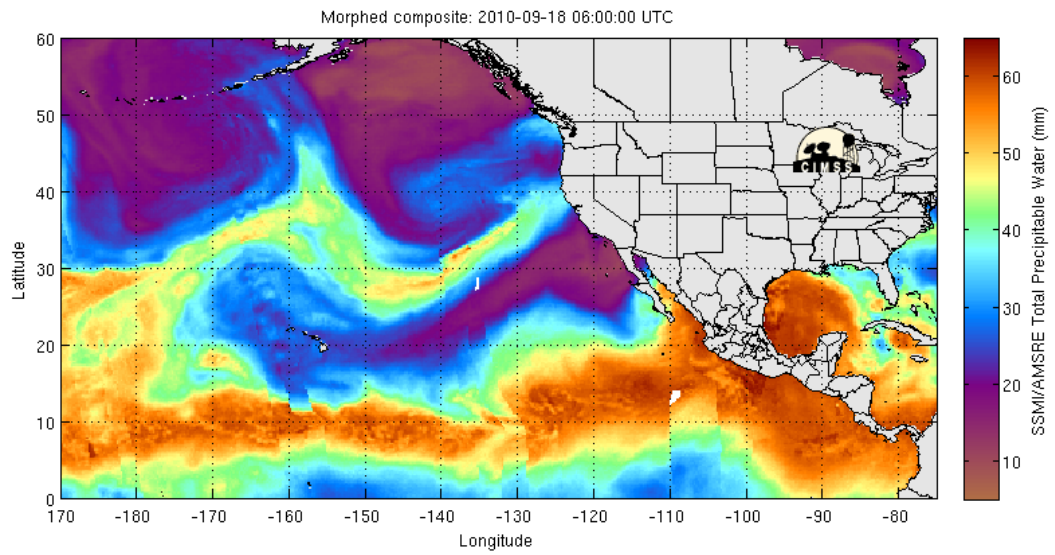
K6



K7

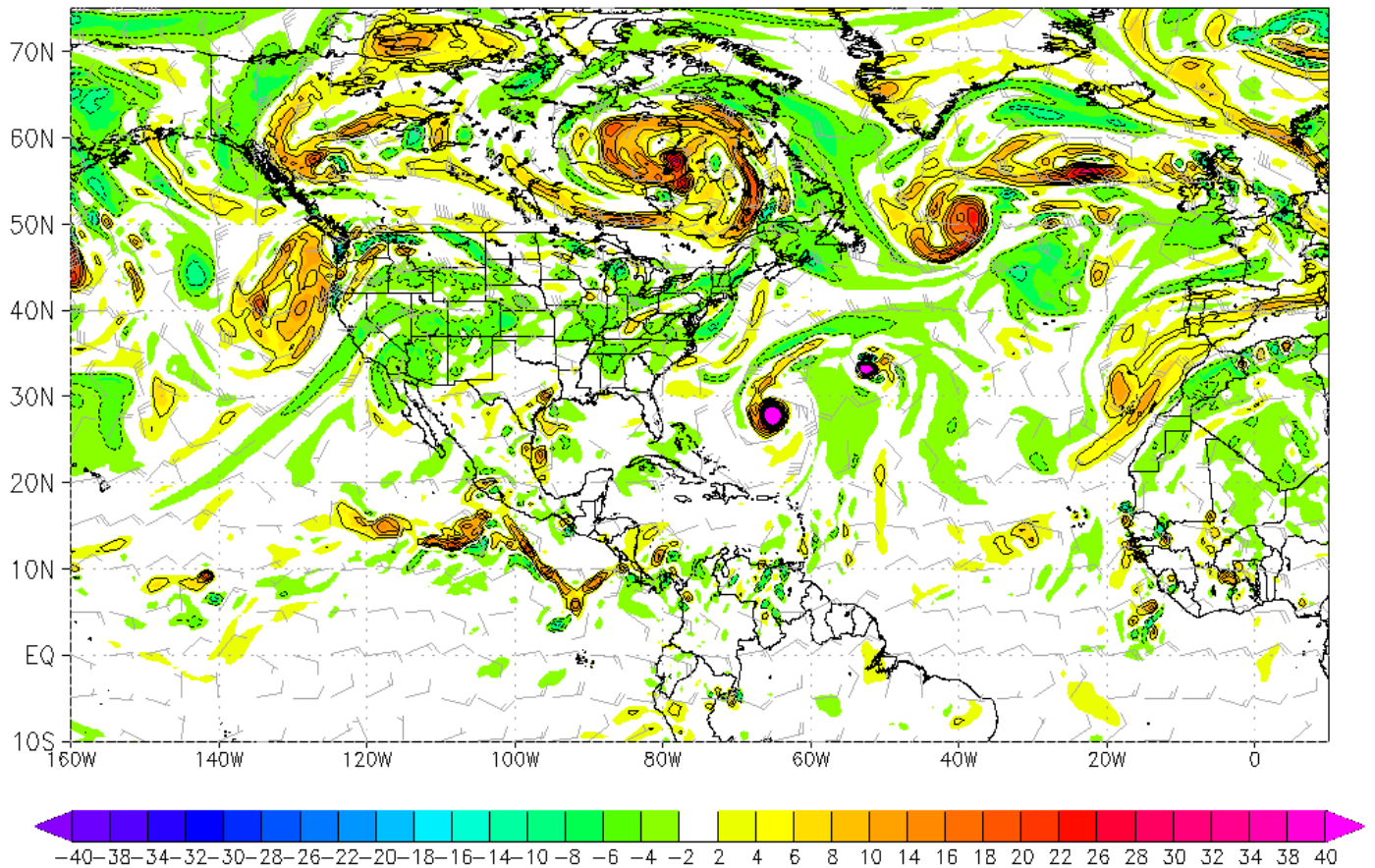


**K8**



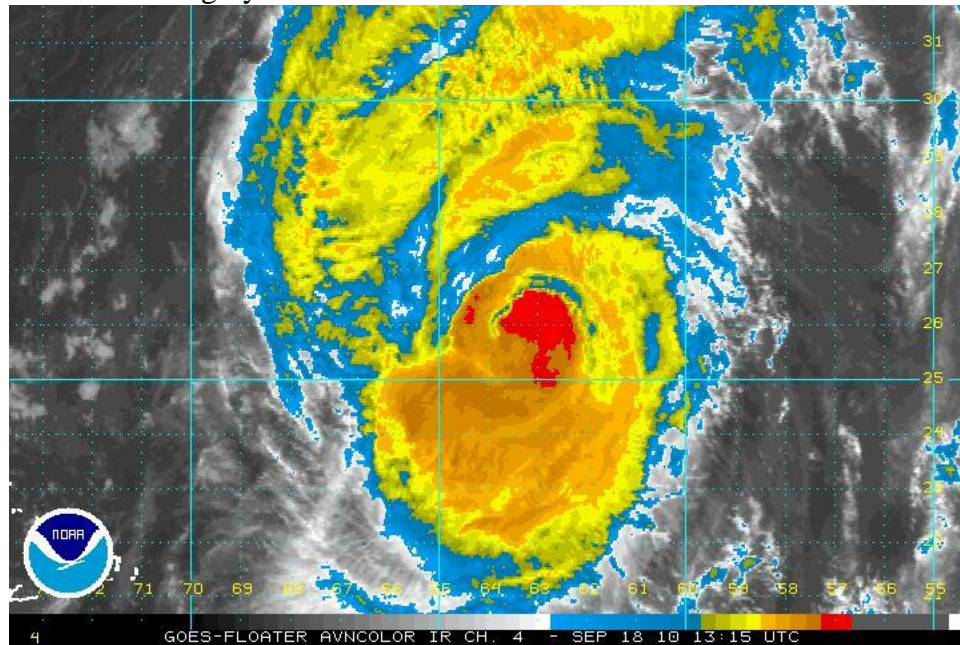
**K9**

06Z18SEP2010 gfs  
500mb vorticity ( $10^{-5}\text{s}^{-1}$ ) T=24 h  
Shading every 2 units; Contouring every 4 units

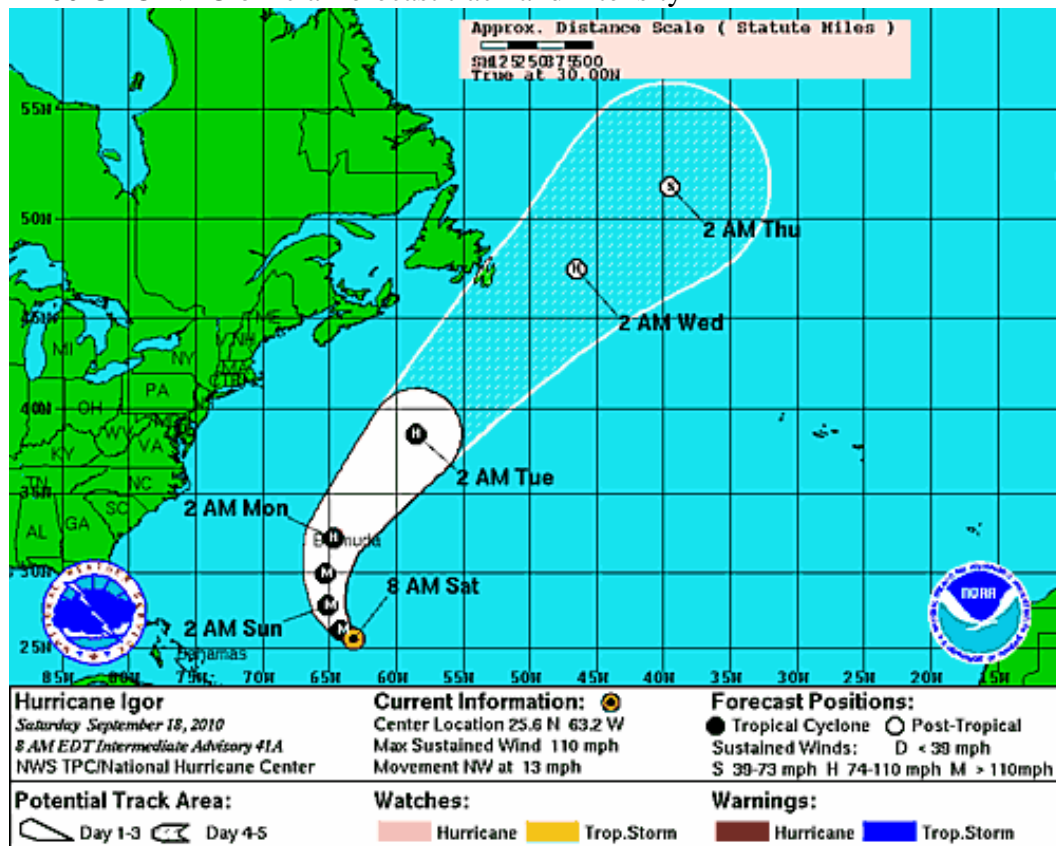




**PGI-41L...Igor:**  
I1 – 1315 UTC IR imagery

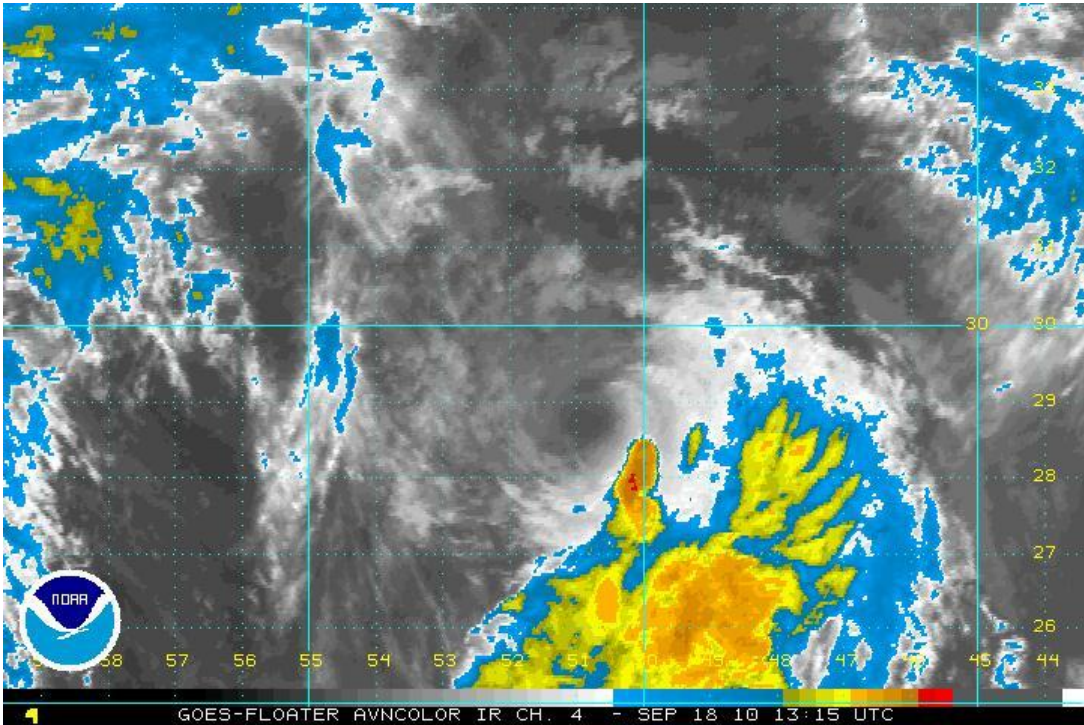


I2 – 1200 UTC NHC official forecast track and intensity

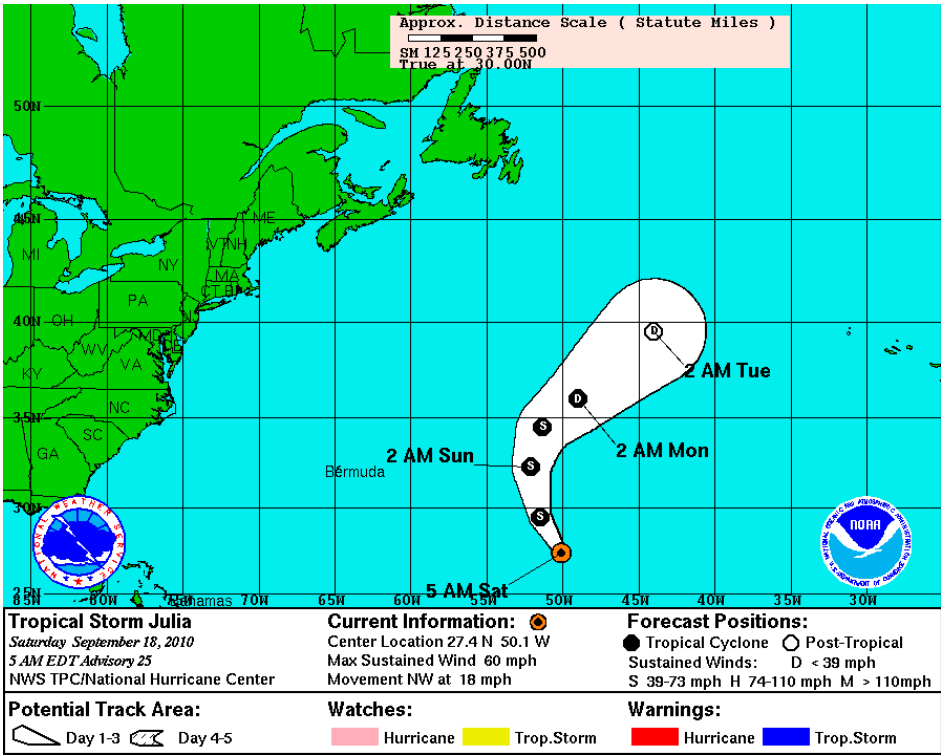




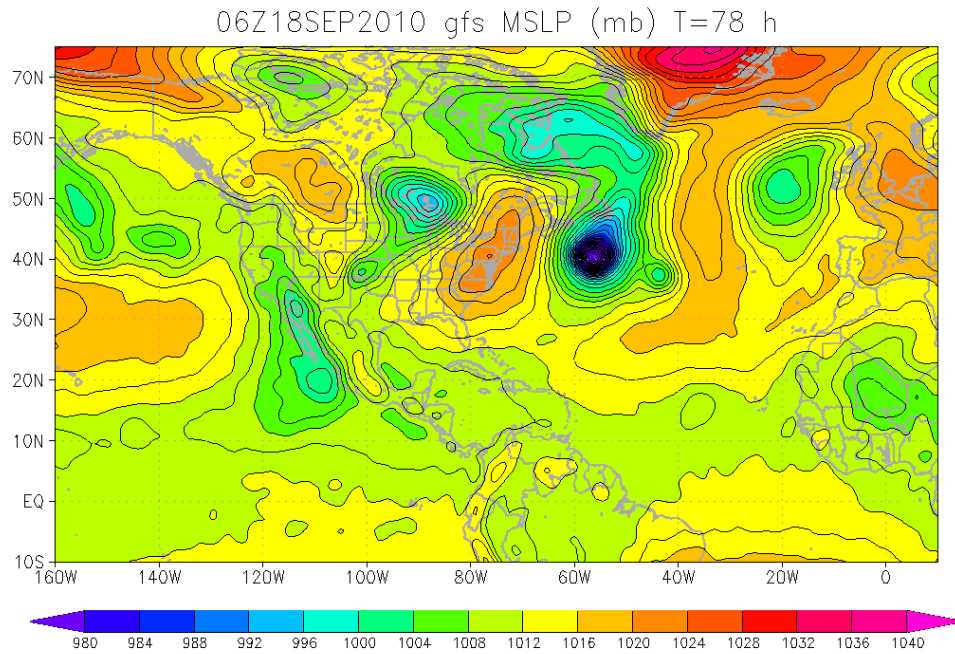
PGI-43L...Julia:  
J1



J2

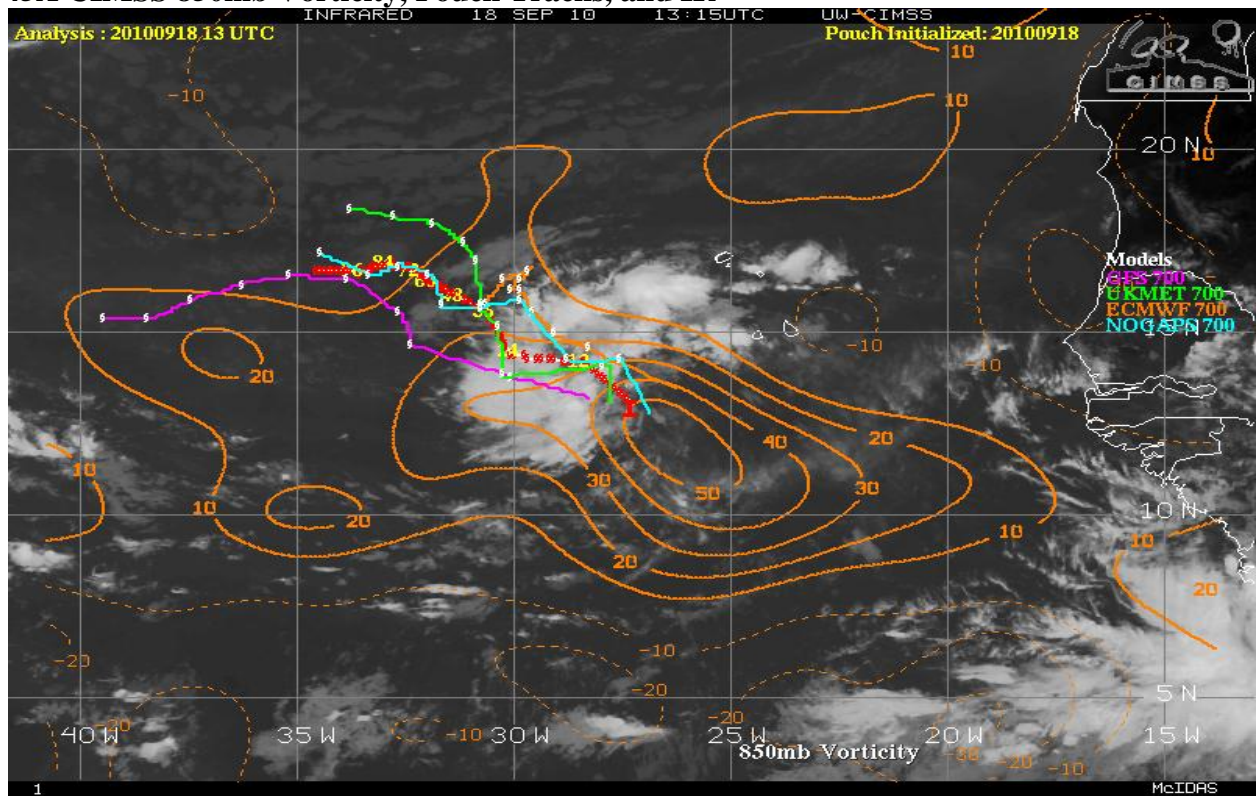


J3



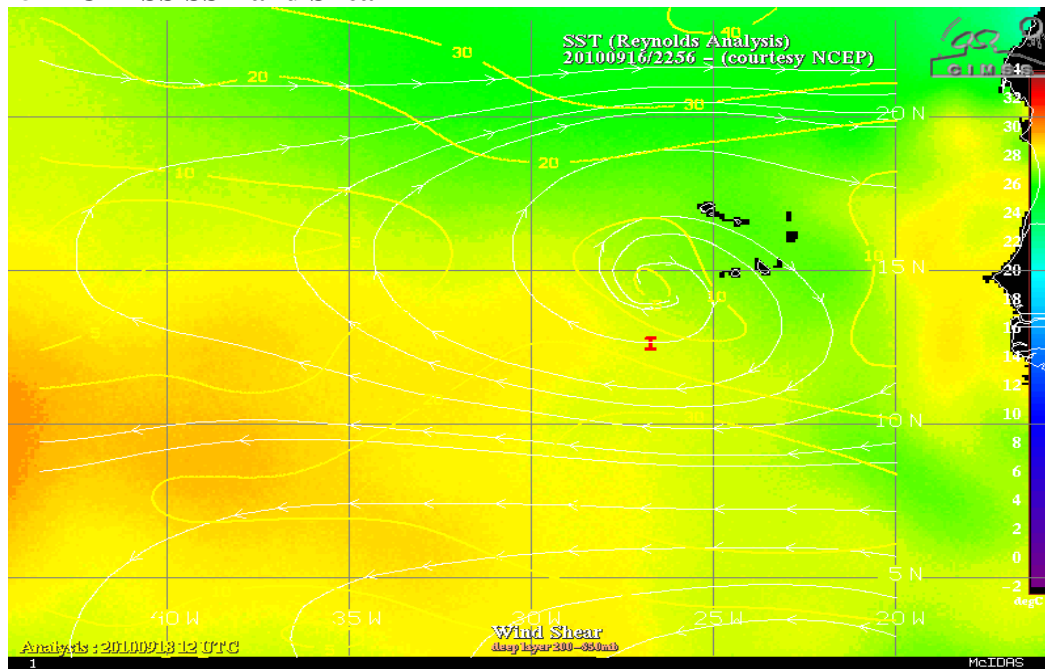
**PGI-45L:**

**45A CIMSS 850mb Vorticity, Pouch Tracks, and IR**





## 45B- CIMSS SST and Shear



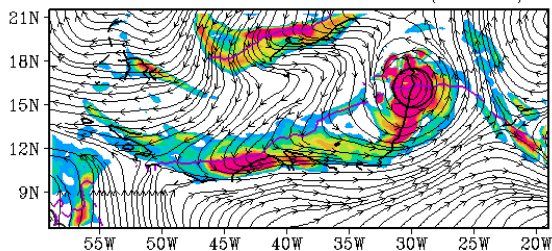
45C

PGI45L: 2010091800 (60h ECMWF valid at 12Z20SEP2010)

Level Tracked: 700 hPa

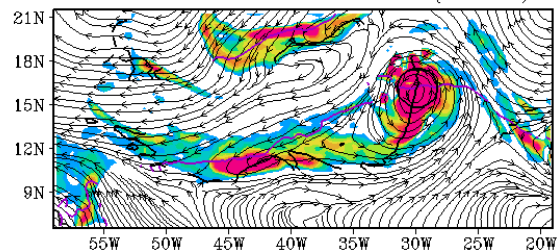
Comoving ( $C_p = -3.1$  m/s)

700 hPa Streamlines and Zeta ( $10^{-6} \text{ s}^{-1}$ )

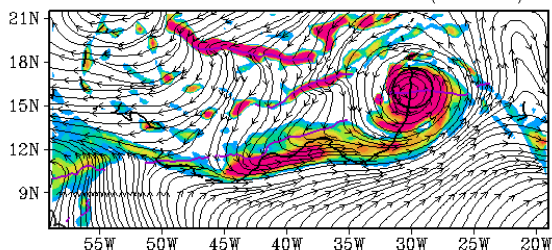


Earth-relative ( $C_p = 0$  m/s)

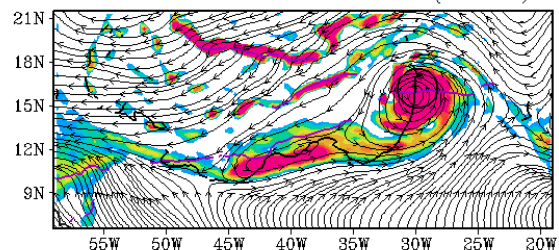
700 hPa Streamlines and Zeta ( $10^{-6} \text{ s}^{-1}$ )



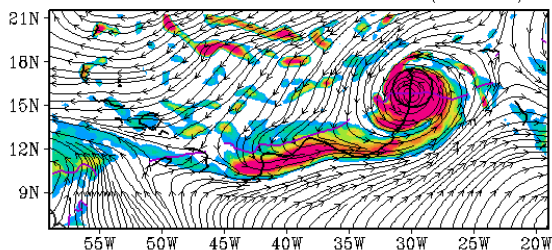
850 hPa Streamlines and Zeta ( $10^{-6} \text{ s}^{-1}$ )



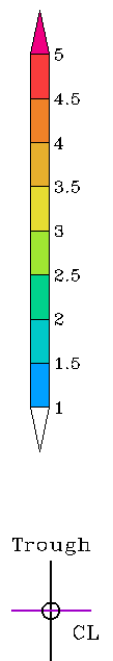
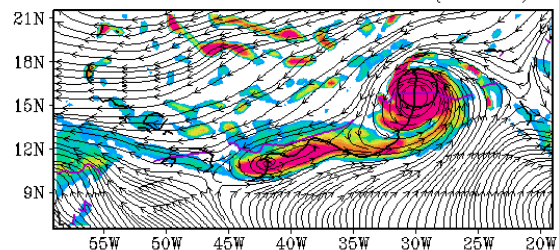
850 hPa Streamlines and Zeta ( $10^{-6} \text{ s}^{-1}$ )



925 hPa Streamlines and Zeta ( $10^{-6} \text{ s}^{-1}$ )

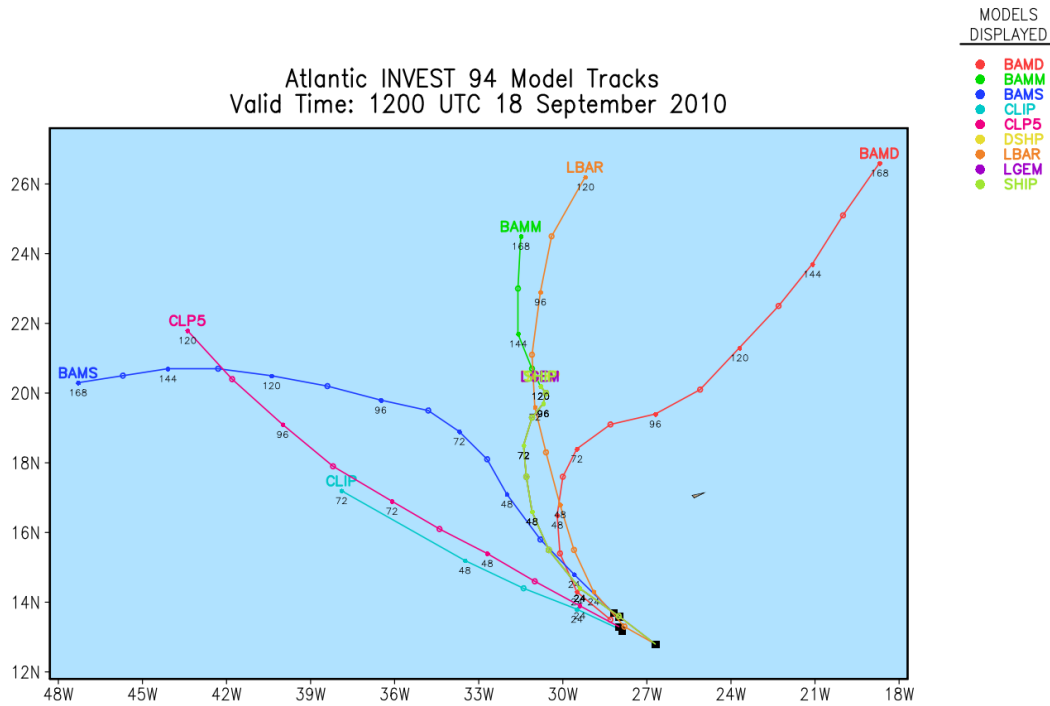


925 hPa Streamlines and Zeta ( $10^{-6} \text{ s}^{-1}$ )





45D

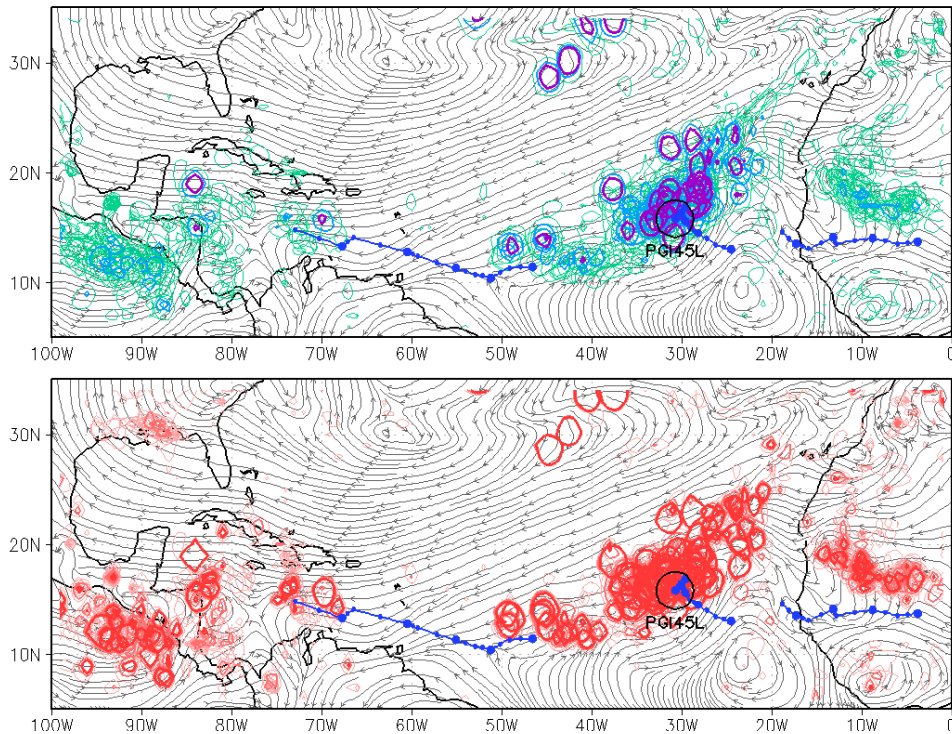


Tropical Cyclone Model Plots  
<http://moe.met.fsu.edu/~ocevans/models/>  
Redistribution of these images is prohibited.

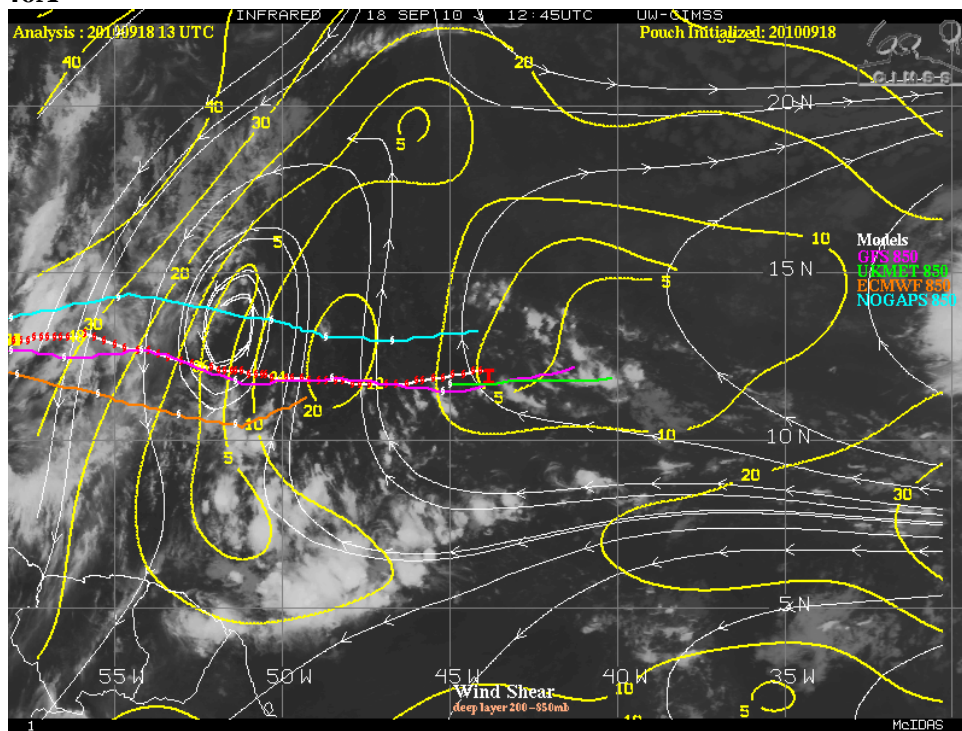
DISCLAIMER: Do not use this image in place of official sources!  
The official NHC forecast is always available at <http://www.nhc.noaa.gov>.  
Forecast points above are shown in 12 hr increments. Initial points denoted by black squares.

45E

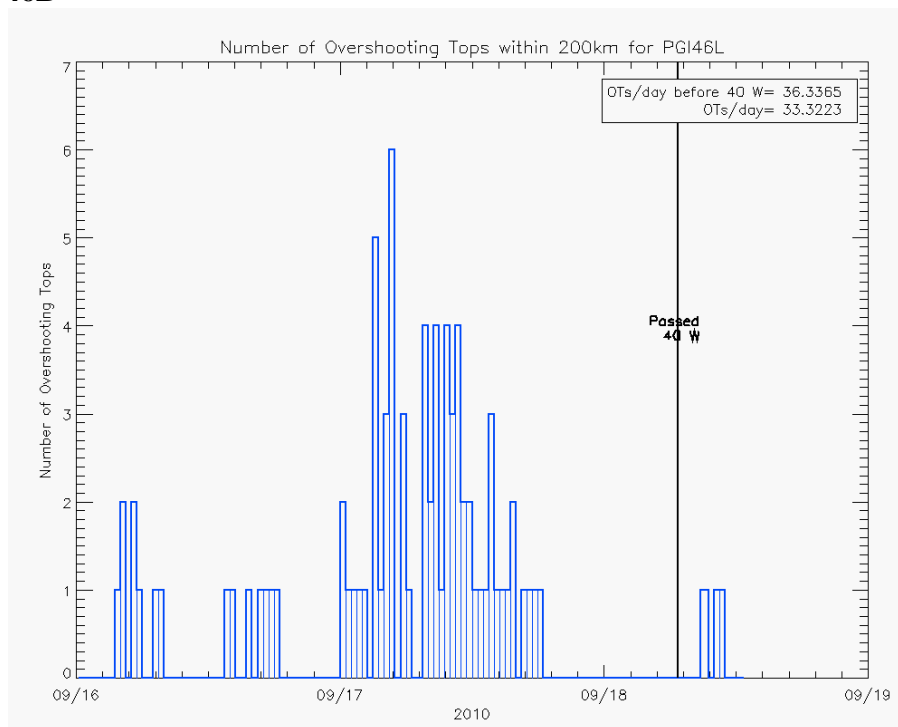
Gray: ECMWF 120-hour CTRL streamlines at 850 hPa. Init. 2010091800, Valid 2010092300.  
Color: Spaghetti contours of ZETA  $\times 5e-5 \text{ s}^{-1}$  and  $0W \times 2e-9 \text{ s}^{-2}$ . 50 members.



**PGI-46L:**  
**46A**

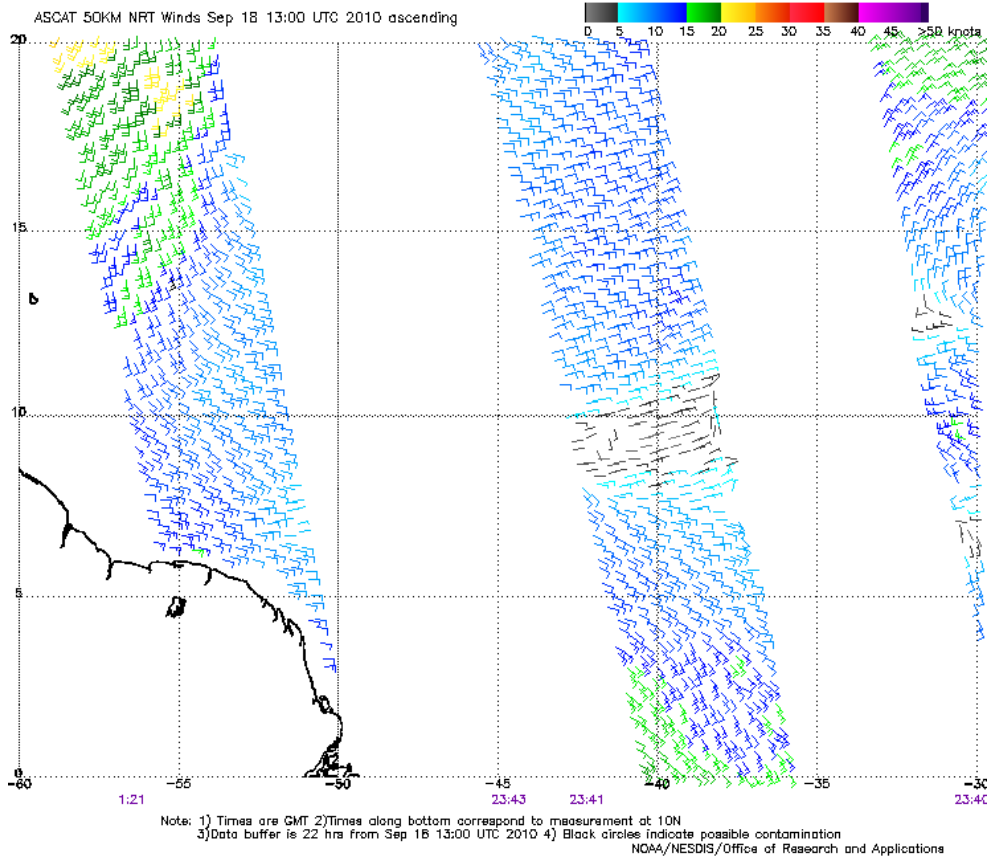


**46B**

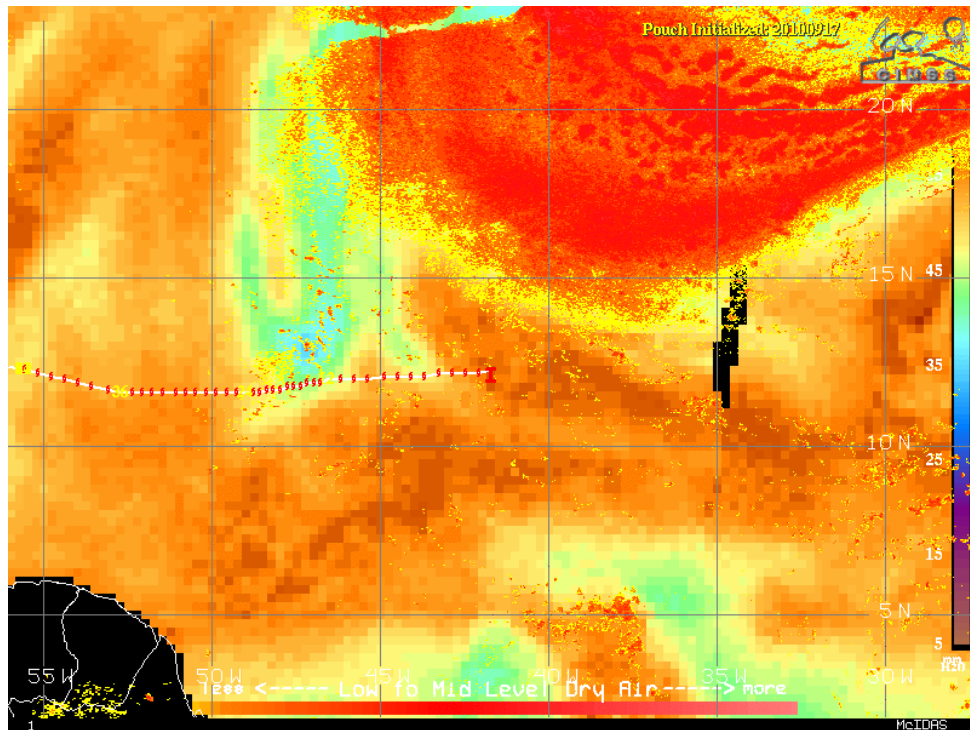




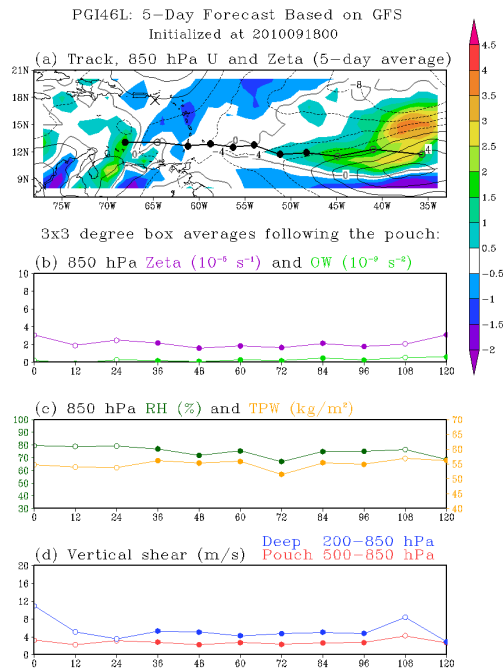
46C



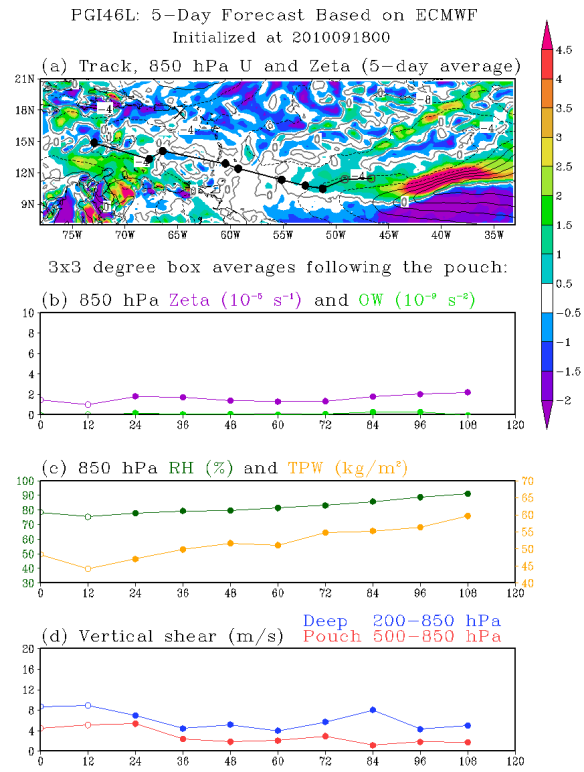
46D



46E



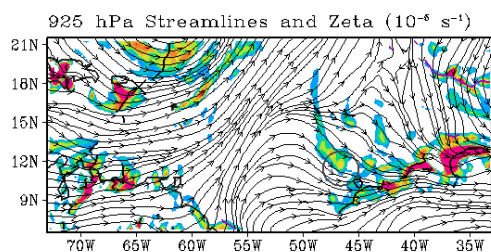
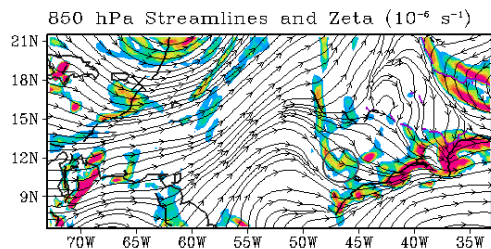
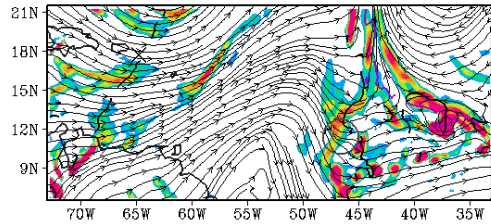
46F



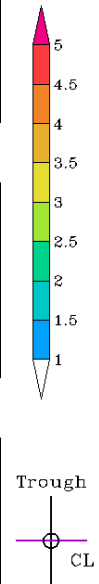
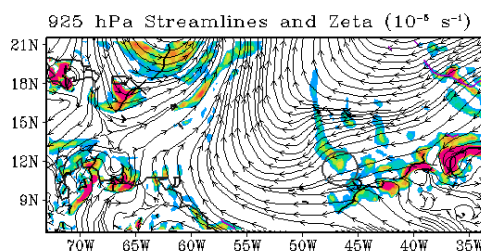
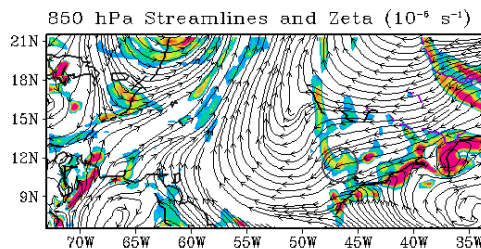
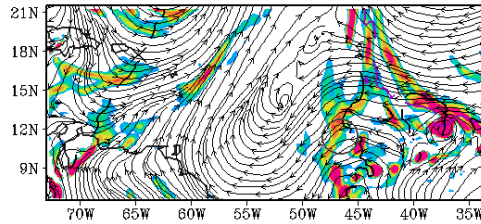
46G

PGI46L: 2010091800 (0h ECMWF valid at 00Z18SEP2010)

Level Tracked: 850 hPa  
Comoving ( $C_p = -7.8 \text{ m/s}$ )  
700 hPa Streamlines and Zeta ( $10^{-6} \text{ s}^{-1}$ )

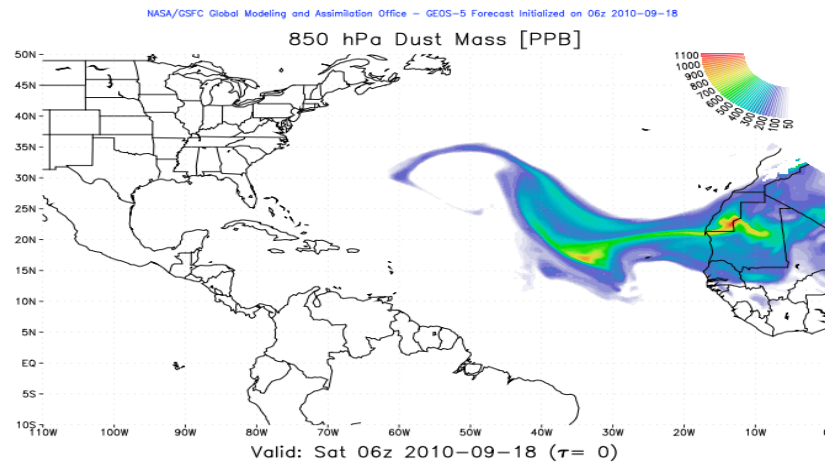


Earth-relative ( $C_p = 0 \text{ m/s}$ )  
700 hPa Streamlines and Zeta ( $10^{-6} \text{ s}^{-1}$ )

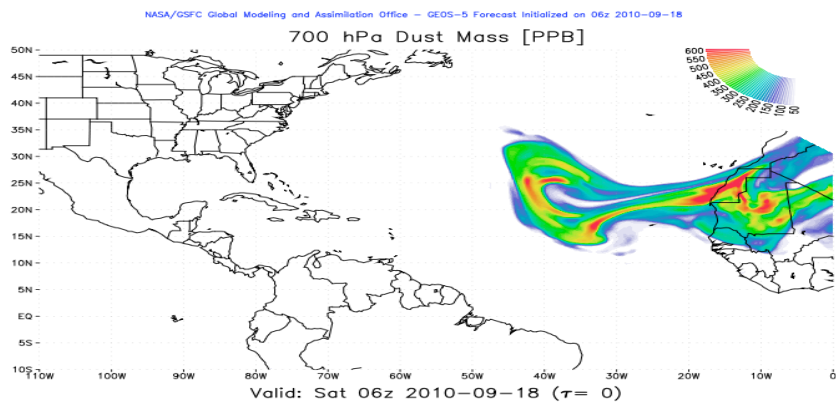




## Dust/SAL: D1



## D2



## D3

